Powerware 9395 UPS
450–550 kVA (2x225 - 2x275 kVA)
User's and Installation Guide

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before operating the equipment and save this manual for future reference.

WARNING

This is a product for commercial and industrial application in the second environment . Installation restrictions or additional measures may be needed to prevent disturbances.

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Powerware 9395 UPS 450–550 kVA (2x225 - 2x275 kVA) User's and Installation Guide

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Contents

1 Introduction 5
1.1 UPS standard features 5
1.1.1 Control panel 5
1.1.2 Customer Interface 7
1.1.3 Advanced Battery Management 7
1.1.4 Power Management Software 7
1.1.5 Installation features 7
1.2 Options and accessories 7
1.2.1 Integrated battery cabinet 7
1.2.2 Optional X-Slot Cards 7
1.3 Basic systemcConfigurations 8
1.4 Using this manual 8
1.5 Conventions used in this manual 8
1.6 Symbols, controls, and indicators 8
1.7 For more information 9
1.8 Getting help 9
2 UPS installation plan and unpacking 10
2.1 Creating an installation plan 10
2.2 Preparing the site 10
2.2.1 Environmental and installation considerations 10
2.2.2 UPS system power wiring preparation 14
2.2.3 UPS system interface wiring preparation 17
2.3 Inspecting and unpacking the UPS cabinet 19
3 UPS system installation 21
3.1 Preliminary installation information 21
3.2 Unloading the UPS cabinet from the pallet and mechanical installation 21
3.3 Battery cabinet installation 23
3.4 Installing UPS external and battery power wiring 25
3.4.1 External power wiring installation 25
3.4.2 Battery wiring 29
3.5 Installing interface connections 29
3.5.1 TB1, TB2, and TB3 connections (other than TB1 battery interface connections) 29
3.5.2 TB1 battery interface connections 34
3.5.3 X-Slot connections 35
3.6 Installing a remote EPO switch 36
3.7 Initial startup 39
3.8 Completing the installation checklist 39
4 Understanding UPS operation 41
4.1 Looking inside the UPS system 41
4.2 Modes 42
4.2.1 Normal mode 42
4.2.2 Bypass mode 43
4.2.3 Battery mode 44
4.3 UPS system oneline configurations 45
5 UPS operating instructions 48
5.1 UPS controls and indicators 49
5.1.1 Control panel 49
5.1.2 Circuit breakers 49
5.2 Using the control panel 50
5.2.1 Status indicators 50
5.2.2 Using the LCD and pushbuttons 51
5.2.3 Using the menu 52
5.2.4 Mimic screen 52
5.2.5 Display menu operation 52
5.2.6 System controls screen 57
5.2.7 Load off screen 58

5.3 Operation 58
5.3.1 Starting the UPS in normal mode 58
5.3.2 Starting the UPS in bypass mode 59
5.3.3 Starting the power module 60
5.3.4 Transfer from normal to bypass mode 60
5.3.5 Transfer from bypass to normal mode 61
5.3.6 Transfer from normal to bypass mode and shut down UPS 61
5.3.7 UPS and critical load shutdown 61
5.3.8 Charger control 62
5.3.9 Using the UPS LOAD OFF pushbutton 62
5.3.10 Using the Remote Emergency Power-off switch 63
5.3.11 Using Mechanical Bypass Switch 64

6 Responding to system events 66
6.1 General 66
6.2 System event horns 66
6.3 System event indicators 66
6.4 System event messages 66

7 Communication 67
7.1 X-Slot cards 67
7.2 Powerware LanSafe Power Management Software 68
7.3 Terminal mode 68
7.3.1 Display UPS control panel 68
7.3.2 Event History Log 68
7.4 Building alarm monitoring 70
7.5 General purpose relay contact 70

8 UPS maintenance 71
8.1 Important safety instructions 71
8.2 Performing preventive maintenance 72
8.2.1 DAILY maintenance 72
8.2.2 MONTHLY maintenance 72
8.2.3 ANNUAL maintenance 72
8.2.4 BATTERY maintenance 72
8.2.5 Maintenance training 72
8.3 Installing batteries 73

9 Recycling the used UPS or batteries 74

10 Product specifications 74
10.1 Model numbers 74
10.2 Single module specifications 74
10.2.1 UPS system input 74
10.2.2 UPS system output 74
10.2.3 Environmental 75

11 Warranty 75

1 Introduction

The Eaton® Powerware® 9395 uninterruptible power supply (UPS) is a true online, continuous-duty, transformerless, double-conversion, solid-state, three-phase system, providing conditioned and uninterruptible AC power to protect the customer's load from all nine power failures. The Powerware 9395 UPS is available as a single module system.

The Powerware online power protection system is used to prevent loss of valuable electronic information, minimize equipment downtime, and minimize the adverse effect on production equipment due to unexpected power problems.

The Powerware 9395 UPS continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with a building's electrical system, the UPS system supplies clean, consistent power that sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, batteries provide emergency power to safeguard operation.

The UPS system is housed in a single, free-standing cabinet with safety shields behind the door for hazardous voltage protection. The cabinet matches the battery and distribution cabinets in style and color and can be installed in line-up-and-match or standalone configurations. Figure 1-1 shows the Powerware 9395 UPS (450–550 kVA).

NOTE

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on page 75 become void. This service is offered as part of the sales contract for the UPS. Contact service in advance (usually a two-week notice is required) to reserve a preferred startup date.

1.1 UPS standard features

The UPS has many standard features that provide cost-effective and consistently reliable power protection. The descriptions in this section provide a brief overview of the UPS standard features.

1.1.1 Control panel

The control panel, located on the UPS front door, contains an LCD and pushbutton switches to control the operation of the UPS, and to display the status of the UPS system. See Chapter 6, "UPS operating instructions," for additional information.

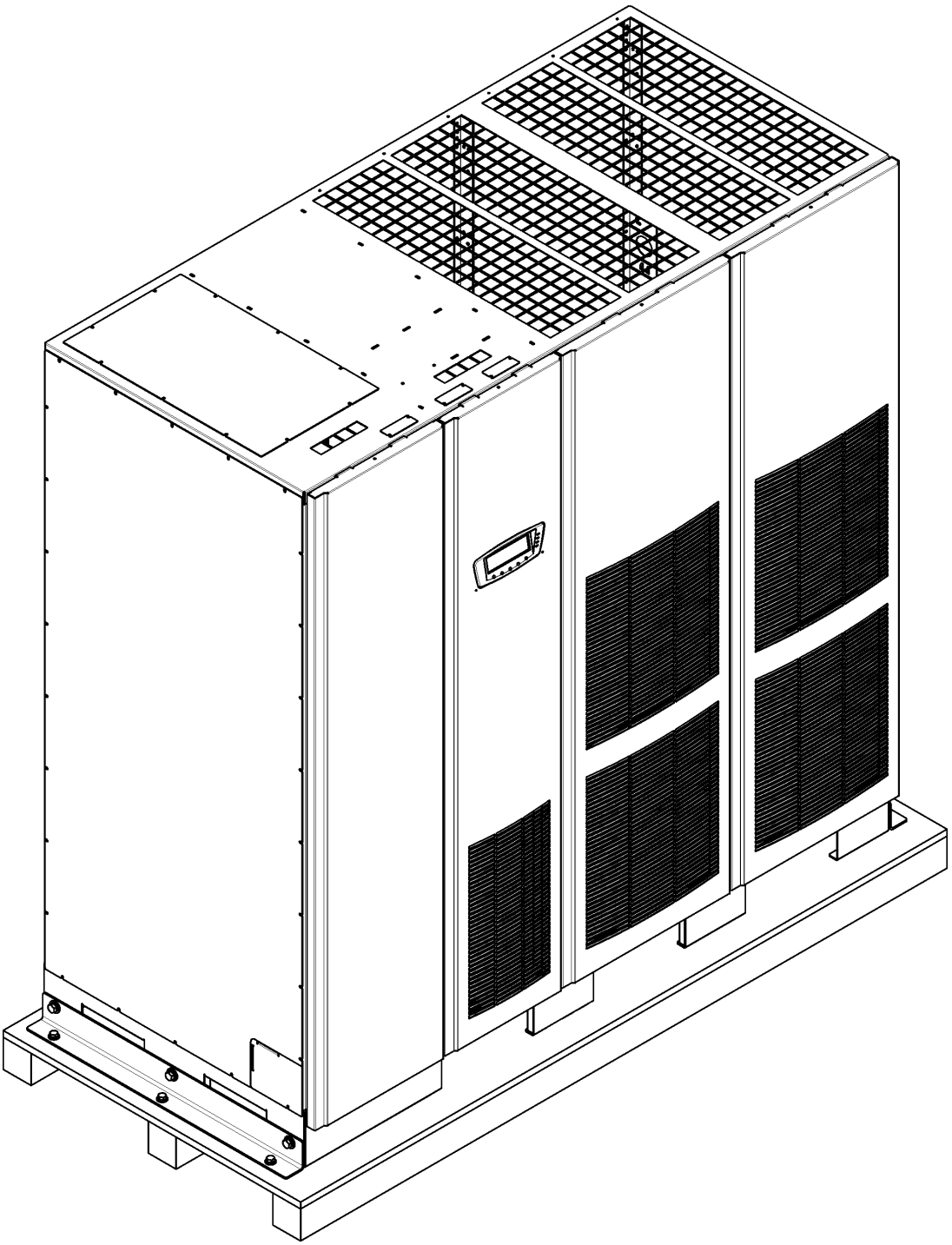


Figure 1-1.Powerware 9395-550 (2*275) cabinet

1.1.2 Customer Interface

- Building Alarm Monitoring – Up to five inputs in the UPS are available to connect the facility's alarm system contacts. Some system configurations may limit the number of inputs available. The UPS uses these inputs to monitor the building alarms in addition to the UPS status. See Chapter 7, "Communication," for additional information.
- Alarm Contact – One alarm contact is provided for connection to equipment at the facility, such as a light, an audible alarm, or a computer terminal. The equipment connected to this contact alerts you to a UPS alarm. See Chapter 7, "Communication," for additional information.
- X-Slot Communication Bay – A four-slot communication bay is standard equipment. Four optional X-Slot cards can be installed in the UPS module at any time. See Chapter 7, "Communication," for additional information.
- ConnectUPS -X Web/SNMP Card – This X-Slot card is provided as standard equipment and provides remote monitoring through a Web browser interface, e-mail, and a network management system (NMS) using SNMP. See Chapter 7, "Communication," for additional information.

1.1.3 Advanced Battery Management

A three-stage charging system increases battery service life by optimizing recharge time, and protects batteries from damage due to high current charging and inverter ripple currents. Charging at high currents can overheat and damage batteries.

1.1.4 Power Management Software

Powerware LanSafe® Power Management Software is bundled as part of the Software Suite CD shipped with the UPS. See Chapter 7, "Communication," for additional information.

1.1.5 Installation features

Cabinets can be permanently bolted to the floor or left standing on leveling feet. Power and control wiring can be routed through the top or bottom of the cabinet with connections made to easily accessible terminals. External sensing and monitoring control wire must be installed in accordance with Class 1 wiring methods. Line-up-and-match battery cabinets are wired through the side panels of the units. Optional X-Slot connectivity cards are quickly installed at the front of the unit and are hot-pluggable.

1.2 Options and accessories

Contact a Powerware sales representative for information about the following options.

1.2.1 Integrated battery cabinet

Battery backup protection can be enhanced by equipping the UPS system with up to four Powerware 9395 battery cabinets containing sealed lead-acid, maintenance-free batteries. The battery cabinet is available in one size, with a 240-cell configuration. The cabinets are designed for line-up-and-match installation, but may be installed separate from the UPS cabinet.

1.2.2 Optional X-Slot Cards

The optional X-Slot cards support several protocols, such as SNMP, HTTP, AS/400®, and Modbus®. See Chapter 7, "Communication," for additional information.

1.3 Basic system configurations

The following basic UPS system configurations are possible:

- Single module UPS and one to four battery cabinets
- Single module UPS and a standalone battery system

The UPS system configuration can be enhanced by adding optional accessories such as a Remote Emergency Power-off (REPO) control, or X-Slot® communication cards.

1.4 Using this manual

This manual describes how to install and operate the Powerware 9395 UPS (450–550 kVA) cabinet. Read and understand the procedures described in this manual to ensure trouble-free installation and operation. In particular, be thoroughly familiar with the REPO procedure (see paragraph 5.3.10 on page 62).

The information in this manual is divided into sections and chapters. The system, options, and accessories being installed dictate which parts of this manual should be read. At a minimum, Chapters 1 through 3 and Chapter 5 should be examined.

Read through each procedure before beginning the procedure. Perform only those procedures that apply to the UPS system being installed or operated.

1.5 Conventions used in this manual

This manual uses these type conventions:

- **Bold type** highlights important concepts in discussions, key terms in procedures, and menu options, or represents a command or option that you type or enter at a prompt.
- *Italic* type highlights notes and new terms where they are defined.
- **Screen type** represents information that appears on the screen or LCD.

Icon	Description
	Information notes call attention to important features or instructions.
[Keys]	Brackets are used when referring to a specific key, such as [Enter] or [Ctrl].

In this manual, the term UPS refers only to the UPS cabinet and its internal elements.
The term UPS system refers to the entire power protection system – the UPS cabinet, the battery cabinet, and options or accessories installed.

1.6 Symbols, controls, and indicators

The following are examples of symbols used on the UPS or accessories to alert you to important information:

RISK OF ELECTRIC SHOCK - Indicates that a risk of electric shock is present and the associated warning should be observed.

CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.

This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, lead-acid batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.

This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

1.7 For more information

Refer to the Powerware 9395 Integrated Battery Cabinet (Model IBC-L) installation manual (1028181) for the following additional information:

- Integrated Battery Cabinet (IBC) installation instructions, including site preparation, planning for installation, wiring, and safety information.
- Detailed illustrations of the cabinet, including dimension and connection point drawings.

Visit www.powerware.com or contact your service representative for information on how to obtain copies of these manuals.

1.8 Getting help

If help is needed with any of the following:

- Scheduling initial startup
- Regional locations and telephone numbers
- A question about any of the information in this manual
- A question this manual does not answer

Call your local service representative

2 UPS installation plan and unpacking

Use the following basic sequence of steps to install the UPS:

1. Create an installation plan for the UPS system (Chapter 2).
2. Prepare your site for the UPS system (Chapter 2).
3. Inspect and unpack the UPS cabinet (Chapter 2).
4. Unload and install the UPS cabinet, and wire the system (Chapter 3).
5. Complete the Installation Checklist (Chapter 3).
6. Have authorized service personnel perform preliminary operational checks and startup.

NOTE

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on page W-1 become void. This service is offered as part of the sales contract for the UPS. Contact service in advance (usually a two-week notice is required) to reserve a preferred startup date.

2.1 Creating an installation plan

Before installing the UPS system, read and understand how this manual applies to the system being installed. Use the procedures and illustrations in the paragraph 2.2 and Chapter 3 to create a logical plan for installing the system.

2.2 Preparing the site

For the UPS system to operate at peak efficiency, the installation site should meet the environmental parameters outlined in this manual. If the UPS is to be operated at an altitude higher than 1500 m, contact your service representative for important information about high altitude operation. The operating environment must meet the weight, clearance, and environmental requirements specified.

2.2.1 Environmental and installation considerations

The UPS system installation must meet the following guidelines:

- The system must be installed on a level floor suitable for computer or electronic equipment.
- The system must be installed in a temperature and humidity controlled indoor area free of conductive contaminants.
- The cabinet can be installed in line-up-and-match or standalone configurations.

Failure to follow guidelines may void your warranty.

The UPS equipment operating environment must meet the weight requirements shown in Table 2-1 and the size requirements shown in Figure 2-1 through Figure 2-7.
Dimensions are in millimeters.

Model	Weight kg	
	Shipping	Installed
Powerware 9395-2*275	1610	1430
Powerware 9395-550	1610	1430

Table 2-1. UPS cabinet weights

The UPS cabinets use forced air cooling to regulate internal component temperature. Air inlets are in the front of the cabinet and outlets are in the top. You must allow clearance in front of and above each cabinet for proper air circulation. The clearances required around the UPS cabinet are shown in Table 2-2.

From top of cabinet	Minimum clearance over the UPS cabinet is 458 mm for ventilation
From front of cabinet	915 mm working space
From back of cabinet	None required
From right side of cabinet	None required, but for easier service 500 mm is recommended.
From left side of cabinet	None required

Table 2-2. UPS cabinet clearances

The basic environmental requirements for operation of the UPS system are:

- Ambient Temperature Range: 0-40°C
- Recommended Operating Range: 20-25°C
- Maximum Relative Humidity: 95%, noncondensing

The UPS ventilation requirements are shown in Table 2-3.

Rating/kVA	Input/output voltage	Heat rejection BTU/hr x 1000/hr (kg-cal/hr)
2*275 kVA	400/400	88.7
550 kVA	400/400	88.7

Table 2-3. Air conditioning or ventilation requirements during full load operation

Ventilation required for cooling air exhaust: approximately 1410 liter/sec/225-275kVA unit.

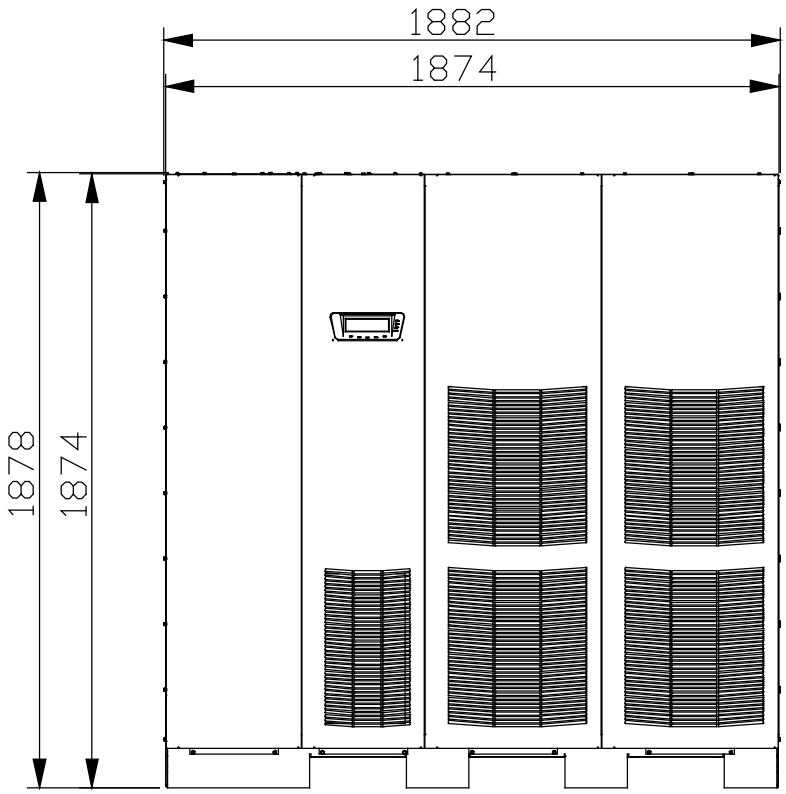


Figure 2-1. UPS cabinet dimensions (front view)

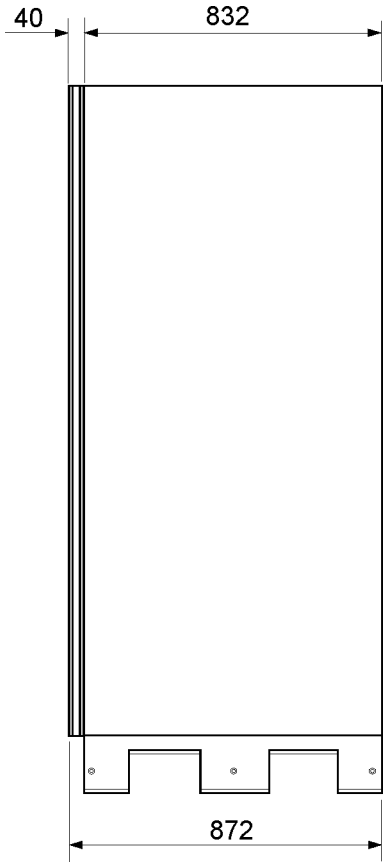


Figure 2-2. UPS cabinet dimensions (right side view)

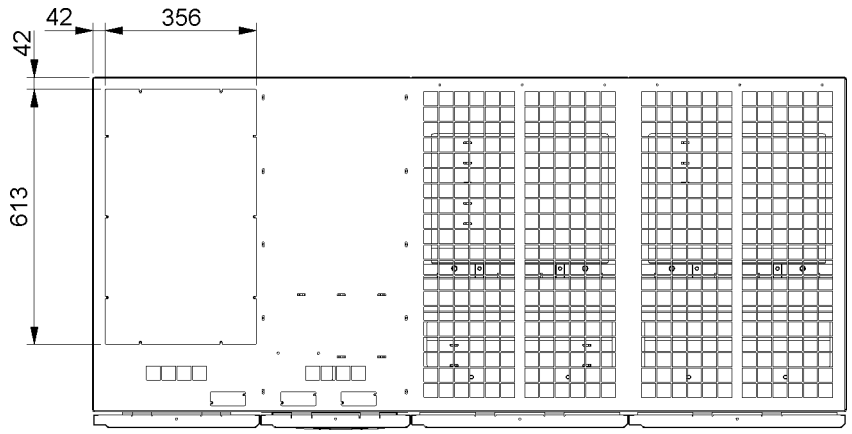


Figure 2-3. UPS cabinet dimensions (top view)

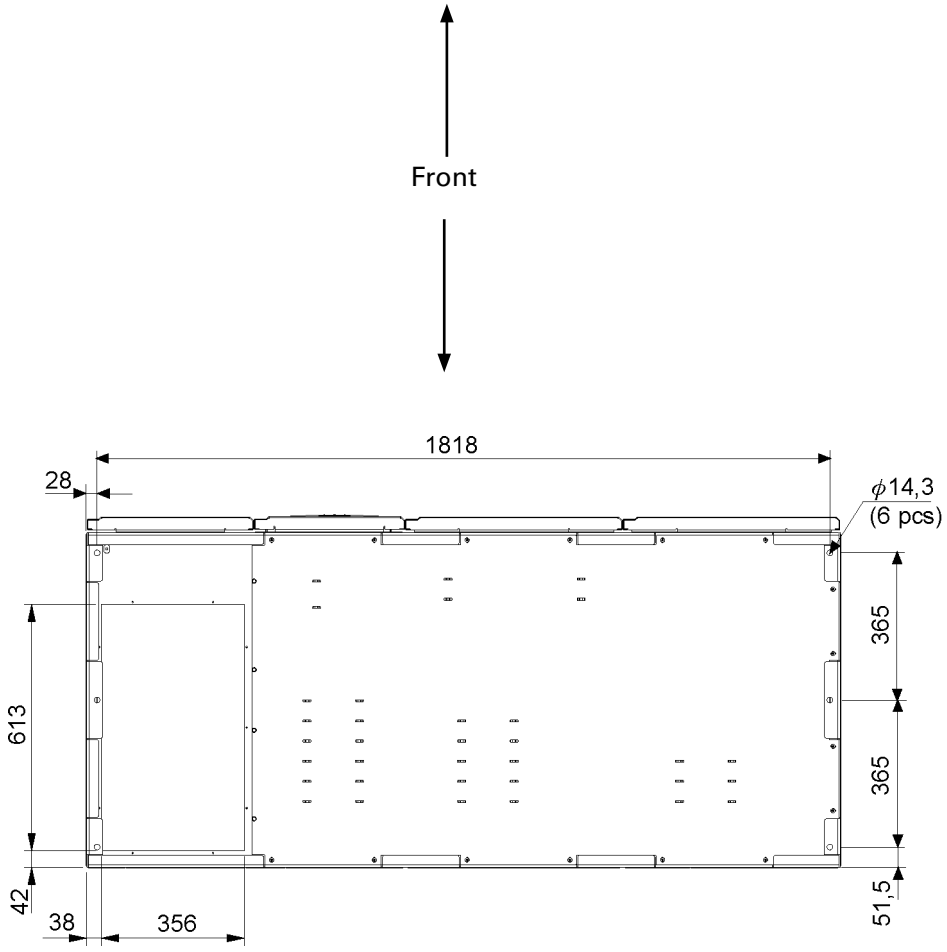


Figure 2-4. UPS cabinet dimensions (bottom view)

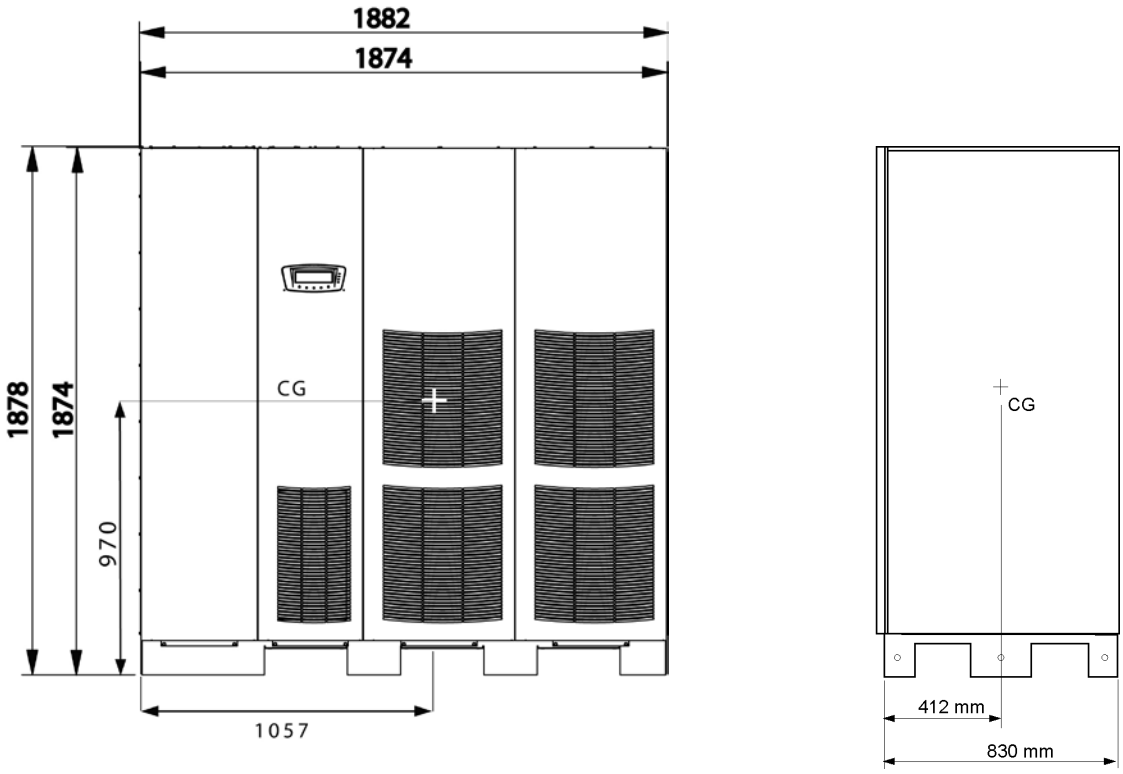


Figure 2-5. UPS cabinet center of gravity

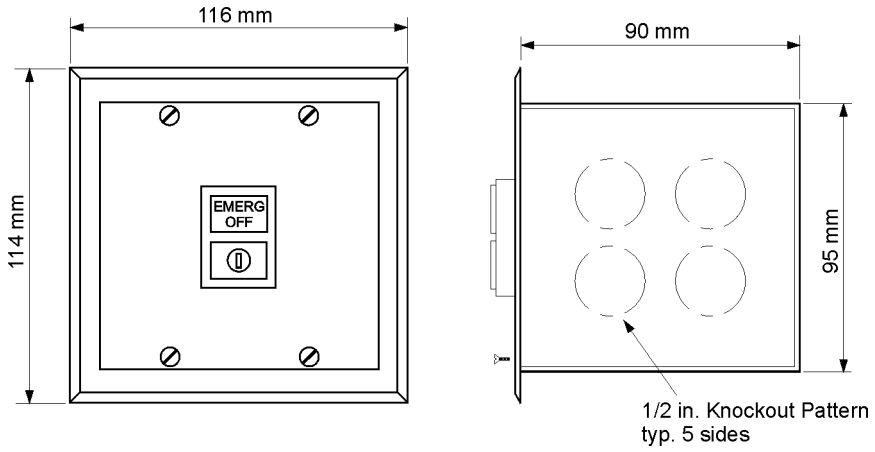


Figure 2-6. Remote EPO switch dimensions

2.2.2 UPS system power wiring preparation

NOTE

If installing, as part of the UPS system, a maintenance bypass without a rectifier input breaker, a minimum of two separate feeds with upstream feeder breakers, or one feed with two upstream feeder breakers, must be provided: one for the UPS and one for the maintenance bypass input. DO NOT use one feed or a single feeder breaker to supply both the UPS and the maintenance bypass.

For external wiring requirements, including the minimum size of external wiring, see Table 2-4. The power wiring connections for this equipment are rated at 70°C. If wire is run in an ambient temperature greater than 30°C, higher temperature wire and/or larger size wire may be necessary.

Rating		Units	Rating 50/60 Hz	
		kVA kW	450 (2*225) 404 (2*202)	550 (2*275) 495 (2*247)
Input and output voltage		Volts	400/400	400/400
AC input to UPS rectifier Full load current plus battery recharge current (3) phases, (1) ground	**A**	Amps	746	912
Minimum conductor size Number per Phase		mm^2 (each)	Refer to national and local rules	
AC Output to UPS Bypass Full load current (3) phases, (1) neutral–if required, (1) ground B	**B**	Amps	672	820
Minimum conductor size Number per phase		mm^2 (each)	Refer to national and local rules	
DC input from battery to UPS (1) positive, (1) negative c	**C**	Amps	950	1300
minimum conductor size number per pole		mm^2 (each)	Refer to national and local rules	
AC output to critical load full load current (3) phases, (1) neutral–if required, (1) ground d	**D**	Amps	580	800
minimum conductor size number per phase		mm^2 (each)	Refer to national and local rules	
NOTE callout letters A, B, C, and D map to figure 6-5 on page 6-6.				

Table 2-4. Input/output ratings and external wiring requirements for the Powerware 9395-550 and 9395-2*275

Read and understand the following notes while planning and performing the installation:

- Refer to national and local electrical codes for acceptable external wiring practices.
- Material and labor for external wiring requirements are to be provided by designated personnel.
- For external wiring, use 70°C copper wire. See the appropriate information in Table 2-4. Wire sizes are based on using the specified breakers.
- The bypass feed into this equipment uses three or four wires. The rectifier feed into this equipment uses three wires. The phases must be symmetrical about ground (from a Wye source) for proper equipment operation.
- If the load requires a neutral, a bypass source neutral must be provided. If the load does not require a neutral and there is no neutral conductor connected at the bypass input, a neutral to ground bonding jumper must be installed. DO NOT install both a source neutral and a bonding jumper.
- The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete. However, remove the shield before operating the UPS. Once the debris shield is removed, do not place objects on the ventilation grill.

Terminals E1 through E12 are 2-hole bus bar mountings for standard NEMA 2-hole barrel lugs. See Table 2-5 for power cable terminations and Table 2-6 for recommended installation parts and tools not supplied by Eaton Corporation. Figure 3-4 and Figure 3-5 show the location of the power cable terminals inside the UPS.

Terminal function	Terminal	Function	Bus landing	Tightening torgue Nm	Bolt size
AC input to UPS rectifier	E1	Phase L1	4-2 bolt mounting	76	M12
	E2	Phase L2	4-2 bolt mounting	76	M12
	E3	Phase L3	4-2 bolt mounting	76	M12
AC input to bypass	E6	Phase L1	4-2 bolt mounting	76	M12
	E7	Phase L2	4-2 bolt mounting	76	M12
	E8	Phase L3	4-2 bolt mounting	76	M12
AC output to critical load	E9	Phase L1	4-2 bolt mounting	76	M12
	E10	Phase L2	4-2 bolt mounting	76	M12
	E11	Phase L3	4-2 bolt mounting	76	M12
DC input from battery to UPS	E4	Battery (+)	4-2 bolt mounting	76	M12
	E5	Battery (-)	4-2 bolt mounting	76	M12
Input and output neutral	E12	Neutral	8-2 bolt mounting	22	M10
Customer ground	Ground	Ground	7-1 bolt mounting	22	M10

NOTE Customer ground, size1/0, can be run in any conduit.

Table 2-5. UPS cabinet power cable terminations for the Powerware 9395-550/450 and 9395-550/550

Part	Size	Quantity	Manufacturer	Part number	Notes
Long barrel 2 hole lug	500 MCM	As required	Thomas & Betts	76 (56)	Color code: brown Die code: 87
Bolt	M12 x 50 mm	As required	N/A	N/A	Quantity per lug hole
Bolt	M10 x 50 mm	As required	N/A	N/A	
Flat washer	M12	As required	N/A	N/A	
Lock washer	M12	As required	N/A	N/A	
Nut	M12	As required	N/A	N/A	
Manual hydraulic crimp tool	14 ton	1	Thomas & Betts	TBM14M	
Die set	N/A	1	Thomas & Betts	15506	

Table 2-6. Recommended installation parts and tool (not supplied by Eaton Corporation)

External overcurrent protection is not provided by this product, but is required by codes. Refer to Table 2-4 for wiring requirements. If an output lockable disconnect is required, it is to be supplied by the user.

UPS model	Input rating	
	Load rating	400 V
9395-2*225	100%	800 A
9395-450	100%	800 A
9395-2*275	100%	1000 A
9395-550	100%	1000 A

Table 2-7 Recommended input circuit breaker ratings.

CAUTION

To reduce the risk of fire, connect only to a circuit provided with maximum input circuit breaker current ratings from Table 2-7 in accordance with the National Electrical Code, ANSI/NFPA 70.

The line-to-line unbalanced output capability of the UPS is limited only by the full load per phase current values for AC output to critical load shown in Table 2-4. The recommended line-to-line load unbalance is 50% or less.

Source protection for the AC input to bypass should be treated as if supplying a 550 kVA three-phase transformer, to allow for inrush current. Bypass input wiring and bypass input breaker rating should be treated as if supplying a 550 kVA load, regardless of the rating of the UPS.

Bypass and output overcurrent protection and bypass and output disconnect switches are to be provided by the user. Table 2-8 lists the recommended rating for bypass and output circuit breakers satisfying the criteria for both.

UPS model	Circuit breaker rating		
	Load rating	400 V	
		Bypass	Output
9395-2*225	100% rated	800 A	160 A (B-type breaker)
9395-450	100% rated	800 A	160 A (B-type breaker)
9395-2*275	100% rated	1000 A	200 A (B-type breaker)
9395-550	100% rated	1000 A	200 A (B-type breaker)

Table 2-8. Recommended bypass and output circuit breaker ratings

There is no DC disconnect device within the UPS. A battery disconnect switch is recommended, and may be required by local codes when batteries are remotely located. The battery disconnect switch should be installed between the battery and the UPS.

External DC input overcurrent protection and disconnect switch for the remote battery location is to be provided by the user. Table 2-9 lists the maximum rating for continuous-duty rated circuit breakers satisfying the criteria for both.

UPS model	Input rating
	600 V
9395-2*275	2*700 A (630 A, depends on end voltage)
9395-550	1400 A (1250 A, depends on end voltage)

Table 2-9. Recommended DC input circuit breaker ratings

Battery voltage is computed at 2 volts per cell. Rated battery current is computed at 2 volts per cell. The battery wiring used between the battery and the UPS should not allow a voltage drop of more than 1% of nominal DC voltage at rated battery current. If the conductors used for DC input from the battery cabinets to the UPS are those provided by the UPS manufacturer, and the UPS and battery cabinets are manufactured by the same supplier, then it is acceptable if they do not meet the noted minimum conductor sizes.

2.2.3 UPS system interface wiring preparation

Control wiring for features and options should be connected at the customer interface terminal blocks located inside the UPS.

WARNING

Do not directly connect relay contacts to the mains related circuits. Reinforced insulation to the mains is required.

Read and understand the following notes while planning and performing the installation:

- Install the interface wiring (for example, building alarm, relay output, battery breaker trip, and X-Slot) separate from the power wiring. The wiring should have double insulation and rated at Uo/U = 300/500 Volts.
- All interface wiring is to be provided by the customer.
- When installing internal interface wiring to X-Slot terminals, route the wiring through the internal opening in the X-Slot communication bay.
- All building alarm inputs or remote features require an isolated normally-open contact or switch (rated at 24 Vdc, 20 mA minimum) connected between the alarm input and common terminal as shown. All control wiring and relay and switch contacts are customer-supplied. Use twisted-pair wires for each alarm input and common.
- The building alarms can be programmed to display the alarm functional name.
- LAN and telephone drops for use with X-Slot cards must be provided by facility planners or the customer.
- The UPS Battery Aux and 48 Vdc Shunt Trip signal wiring from the UPS must be connected to the DC source disconnect device.
- Battery Aux and 48 Vdc Shunt Trip wiring should be a minimum of 1.5 mm^2.
- The Remote EPO feature opens all contactors in the UPS cabinet and isolates power from your critical load. Local electrical codes may also require tripping upstream protective devices to the UPS.
- The Remote EPO switch must be a dedicated switch not tied to any other circuits.
- A jumper wire must be connected between pins 1 and 2 on TB1, if the normally-closed Remote EPO contact is not used.
- Remote EPO wiring should be a minimum of 0.75 mm^2 and a maximum of 2.5 mm^2.
- The maximum distance between the Remote EPO and the UPS cannot exceed 150 meters.
- Alarm relay contacts have a maximum current rating of 5A and a switched voltage rating of 30 Vac and 28 Vdc.
- Alarm relay wiring should be a minimum of 0.75 mm^2.

2.3 Inspecting and unpacking the UPS cabinet

The UPS cabinet is palleted separately for shipping. The cabinet is shipped bolted to a wooden pallet and protected with outer protective packaging material (see Figure 3-8).

CAUTION

The UPS cabinet is heavy (see Table 2-1 on page 11). If unpacking instructions are not closely followed, the cabinet may tip and cause serious injury.

1. Carefully inspect the outer packaging for evidence of damage during transit.

CAUTION

Do not install a damaged cabinet. Report any damage to the carrier and contact your service representative immediately.

NOTE

For the following step. verify that the forklift or pallet jack is rated to handle the weight of the cabinet (see Table 2-1 on page 11 for cabinet weight).

2. Use a forklift or pallet jack to move the packaged cabinet to the installation site, or as close as possible, before unpacking. Insert the forklift or pallet jack forks from the right side of the cabinet, between the supports on the bottom of the pallet (see Figure 2-6 on page 14 for the UPS cabinet center of gravity measurements).

CAUTION

Do not tilt the UPS cabinet more than 10° from vertical or the cabinet may tip over.

3. Set the pallet on a firm, level surface, allowing a minimum clearance of 3 m on each side for removing the cabinet from the pallet.

NOTE

The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete.

4. Remove the protective covering from the cabinet.
5. Remove the packing material, and discard or recycle in a responsible manner.
6. After removing the protective covering, inspect the contents for any evidence of physical damage, and compare each item with the Bill of Lading. If damage has occurred or shortages are evident, contact your service representative immediately to determine the extent of the damage and its impact upon further installation.

NOTE

While waiting for installation, protect the unpacked cabinet from moisture, dust, and other harmful contaminants. Failure to store and protect the UPS properly may void your warranty.

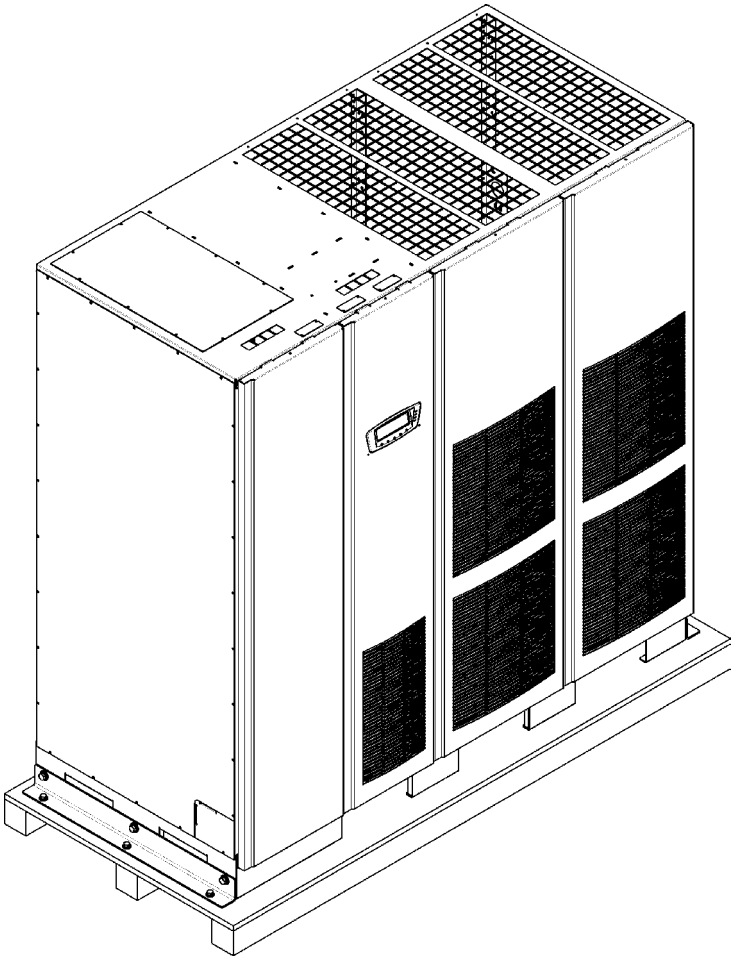


Figure 2-8. Powerware 9395 UPS (2*275 kVA) cabinet as shipped on pallet

3 UPS system installation

3.1 Preliminary installation information

WARNING

Installation should be performed only by qualified personnel.

Refer to the following while installing the UPS system:

- Chapter 2 for cabinet dimensions, equipment weight, wiring and terminal data, and installation notes.
- Do not tilt the cabinet more than ±10° during installation.
- The landing plates are to be removed to add holes as required. Plate material is 16 gauge steel (1.5 mm/0.06” thick).
- If perforated floor tiles are required for ventilation, place them in front of the UPS.

3.2 Unloading the UPS cabinet from the pallet and mechanical installation

The UPS cabinet is bolted to a wooden pallet supported by wood skids. To remove the pallet and mechanically install the UPS, perform the following procedure:

NOTE

When a line-up-and-match UPS system is ordered together with battery cabinets, the first battery cabinet is supplied with two cosmetic covers. The UPS cabinet, additional battery cabinets, and other ancillary cabinets are supplied without cosmetic covers.

NOTE

When a UPS system is ordered together with battery cabinets for standalone installation, the first battery cabinet is supplied with two cosmetic covers. Additional battery cabinets are supplied without cosmetic covers. Cosmetic covers must be ordered for the UPS cabinet and/or other ancillary cabinets.

WARNING

The UPS cabinet is heavy. See Table 2-1 on page 11 for weight of cabinets. If unloading instructions are not closely followed, the cabinet may cause serious injury.

CAUTION

- **Do not tilt cabinets more than 10° from vertical.**
- **Lift the cabinet only with a forklift or damage may occur.**

NOTE

For the following steps, verify that the forklift or pallet jack is rated to handle the weight of the cabinet (see Table 2-1 on page 11 for cabinet weight).

1. If not already accomplished, use a forklift or pallet jack to move the cabinet to the installation area, or as close as possible, before unloading from the pallet. Insert the forklift or pallet jack forks from the right side of the cabinet, between the supports on the bottom of the pallet (see Figure 2-6 on page 13 for the UPS cabinet center of gravity measurements).
2. Remove the three bolts securing the left side shipping bracket to the cabinet and three bolts securing the bracket to the pallet (see Figure 3-1). Remove the front shipping bracket. If installing the cabinet permanently, retain the shipping bracket and securing hardware for later use.
3. Remove the three bolts securing the right side shipping bracket to the cabinet and three bolts securing the bracket to the pallet (see Figure 3-2). Remove the front shipping bracket. If installing the cabinet permanently, retain the shipping bracket and securing hardware for later use.
4. Using the forklift, raise the UPS cabinet section until the cabinet bottom clears the pallet by approximately 3 mm.
5. Once the UPS cabinet is clear of the pallet, pull the pallet from under the UPS cabinet. Discard or recycle the pallet in a responsible manner.
6. Using the forklift, move the UPS cabinet to the final installed location.
7. Carefully lower the UPS cabinet until the cabinet base contacts the floor.
8. If permanently mounting the system, proceed to Step 9; otherwise, continue to Step 11.
9. Using the retained hardware, reinstall the shipping brackets removed in Steps 2 and 3 to the left and right side of the UPS cabinet with the angle facing outward (see Figure 3-1 and Figure 3-2).
10. Secure the cabinet to the floor with customer-supplied hardware.
11. If installing a battery cabinet, proceed to paragraphs 3.3; otherwise, proceed to paragraph 3.4.

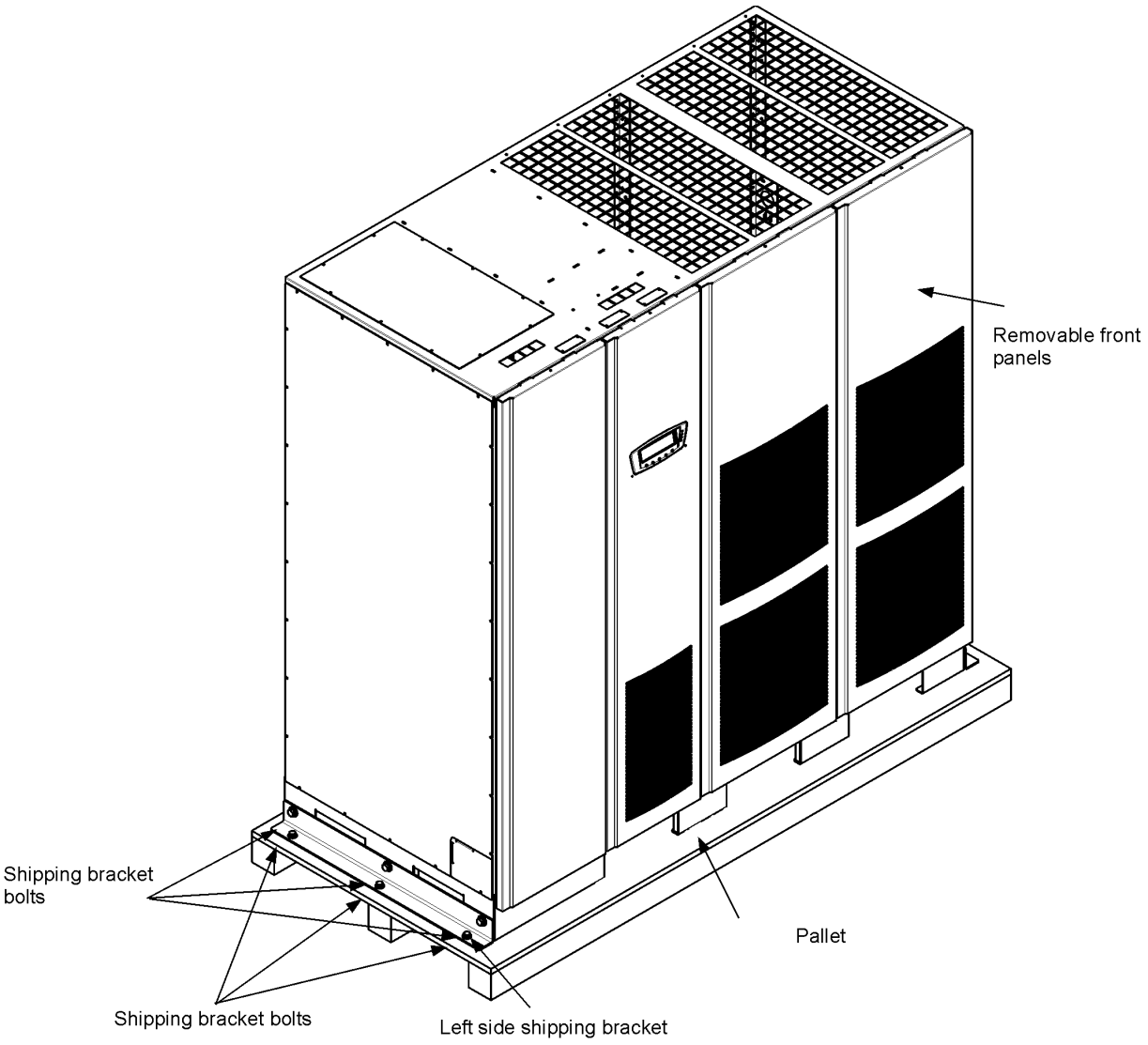


Figure 3-1. Removing left side shipping bracket

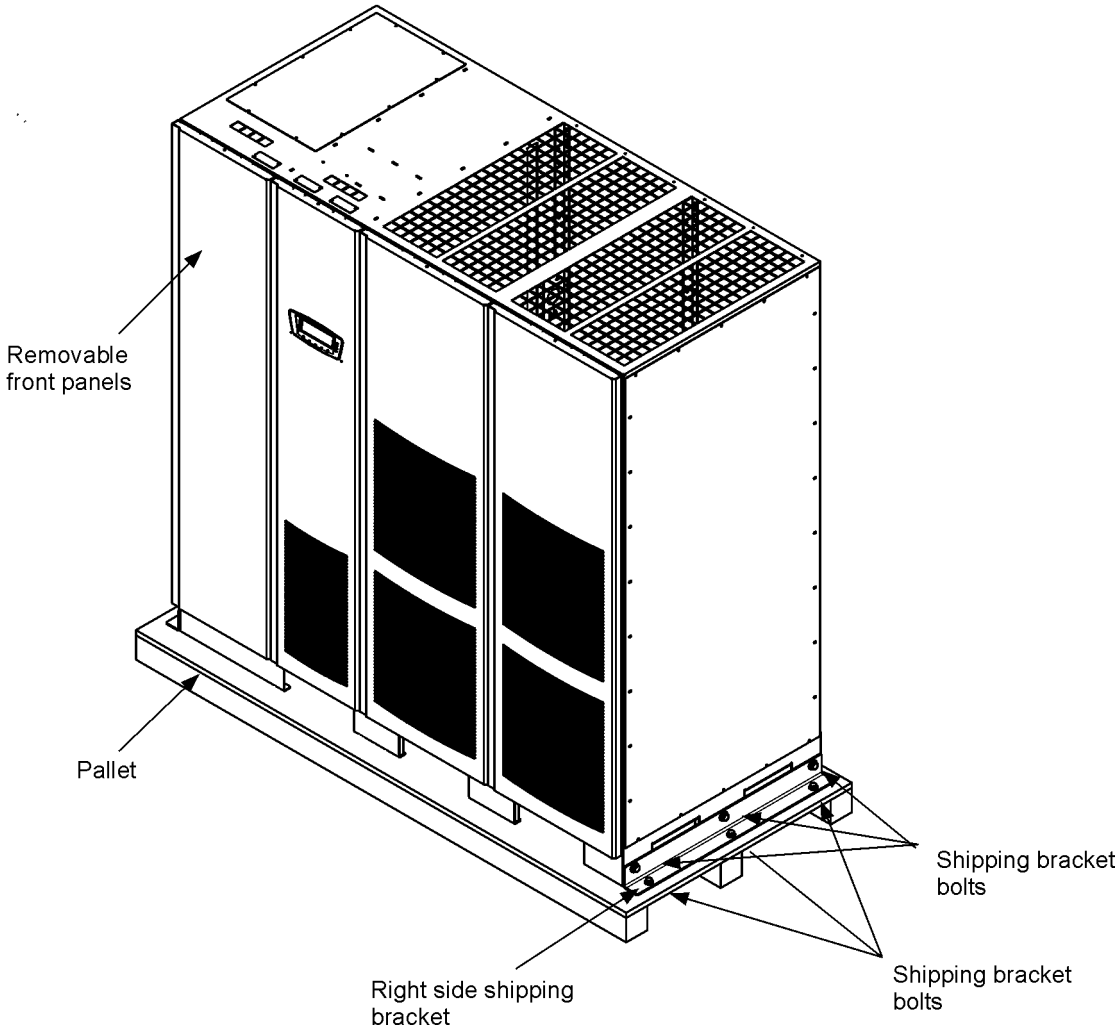


Figure 3-2. Removing right side shipping bracket

3.3 Battery cabinet installation

To install the battery cabinet, refer to the Powerware 9395 Integrated Battery Cabinet (Model IBC-L) installation manual. After the battery cabinet is installed, return to paragraph 3.4 to wire the UPS and battery cabinet.

3.4 Installing UPS external and battery power wiring

NOTE

The UPS cabinet is shipped with a debris shield covering the ventilation grill on top of the unit. Do not remove the debris shield until installation is complete. However, remove the shield before operating the UPS. Once the debris shield is removed, do not place objects on the ventilation grill.

NOTE

Remove the UPS cabinet top or bottom conduit landing plate to drill or punch conduit holes (see Figure 3-3).

NOTE

If the load requires a neutral, a bypass source neutral must be provided. If the load does not require a neutral and there is no neutral conductor connected at the bypass input, a neutral to ground bonding jumper must be installed. DO NOT install both a source neutral and a bonding jumper. See Table 2-4 on page 15 for neutral bonding jumper wire sizes. Bonding jumper must be copper wire.

Use the procedures in the following paragraphs to connect the external and battery power wiring.

3.4.1 External power wiring installation

To install wiring to connections:

1. Remove one top screw and two bottom screws securing the UPS left front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
2. Route the input and output cables through either the top or bottom of the cabinet to the UPS terminals. See Figure 3-3 through Figure 3-5 for wiring access information and terminal locations.
3. Connect phase L1, L2, and L3 (E1, E2, E3), rectifier input power wiring from the utility source to the rectifier input terminals in the UPS cabinet. See paragraph 2.2.2 on page 14 for wiring and termination requirements.
4. Connect phase L1, L2, and L3 (E6, E7, E8), and Neutral (if required) bypass input power wiring from the utility source to the bypass input terminals and neutral terminals in the UPS cabinet. See paragraph 2.2.2 on page 14 for wiring and termination requirements.
5. Connect phase L1, L2, and L3 (E9, E10, E11), and Neutral (if required) power wiring from output terminals and neutral terminals to the critical load. See paragraph 2.2.2 on page 14 for wiring and termination requirements.
6. Proceed to paragraph 3.4.2.

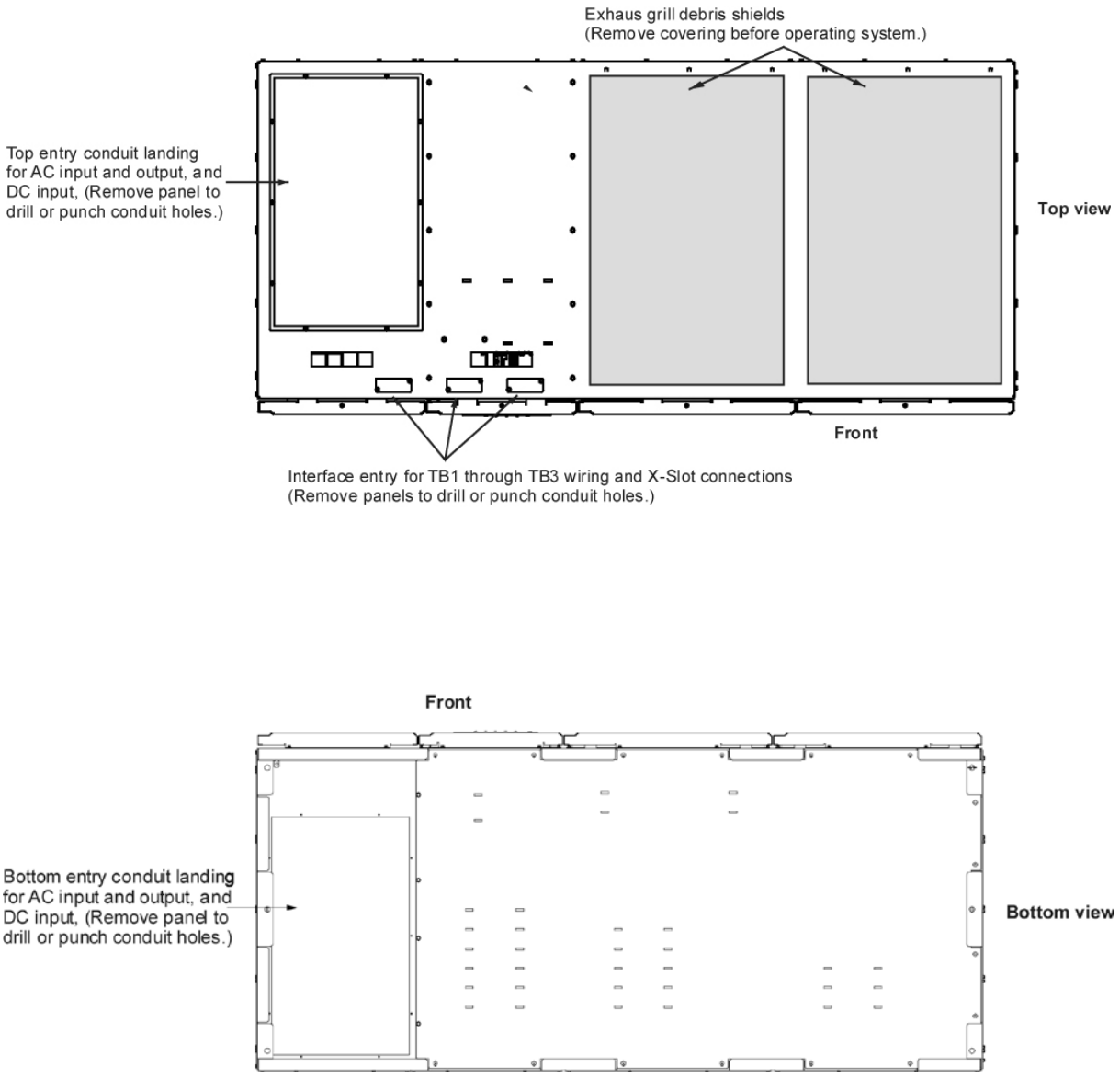

Exhaus grill debris shields
(Remove covering before operating system.)
Top entry conduit landing
for AC input and output, and
DC input, (Remove panel to
drill or punch conduit holes.)
Top view
Front
Interface entry for TB1 through TB3 wiring and X-Slot connections
(Remove panels to drill or punch conduit holes.)
Front
Bottom entry conduit landing
for AC input and output, and
DC input, (Remove panel to
drill or punch conduit holes.)
Bottom view

Figure 3-3. Conduit and wire entry locations

Front view

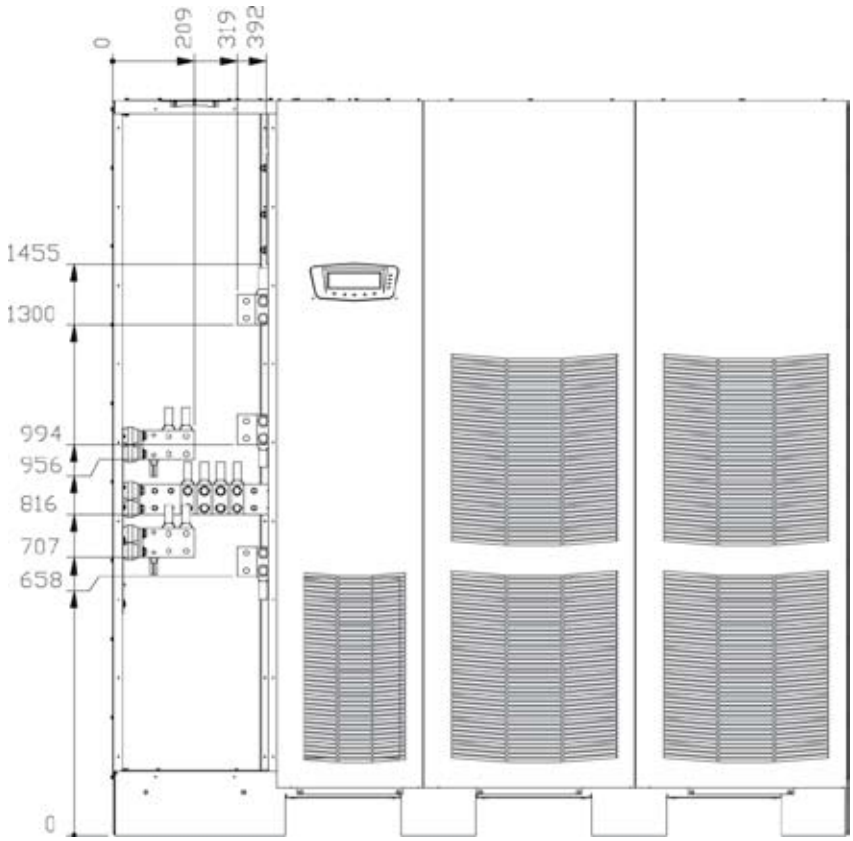


Figure 3-4 a UPS power terminal locations

Side view

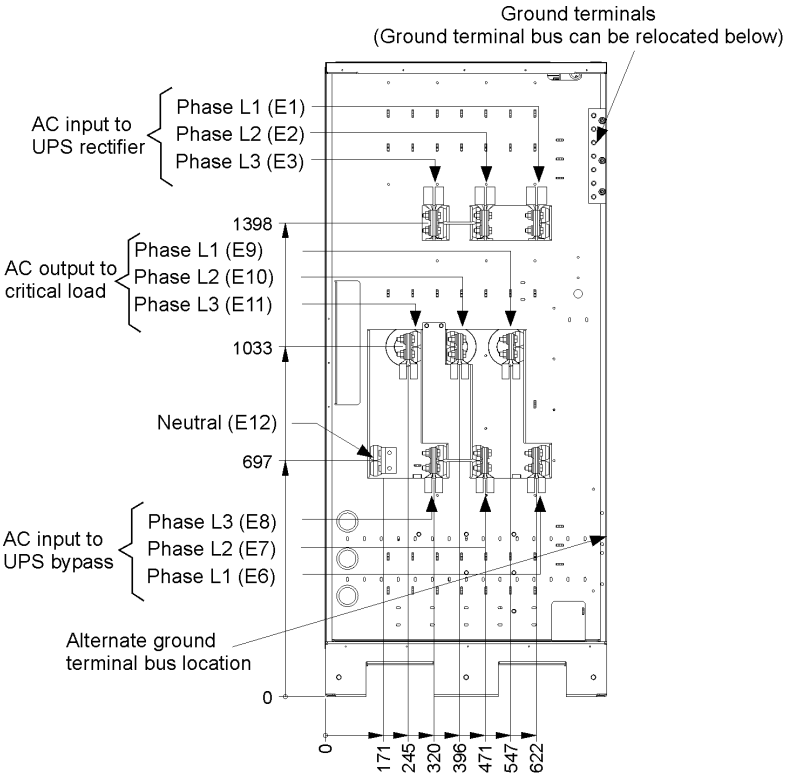


Figure 3-4. b UPS power terminal locations

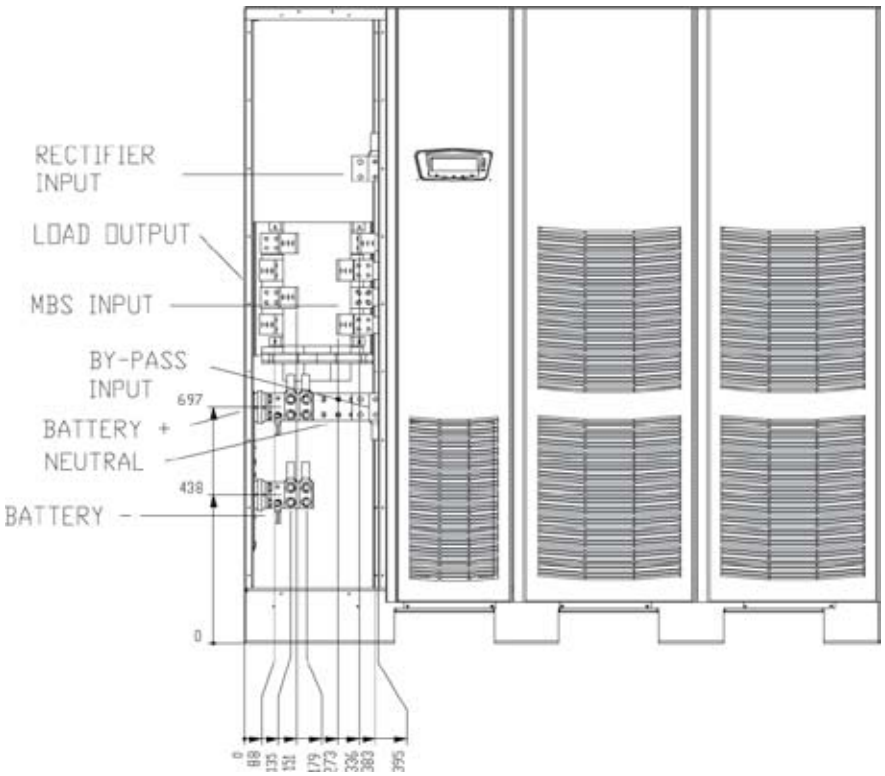


Figure 3-5 a, front view

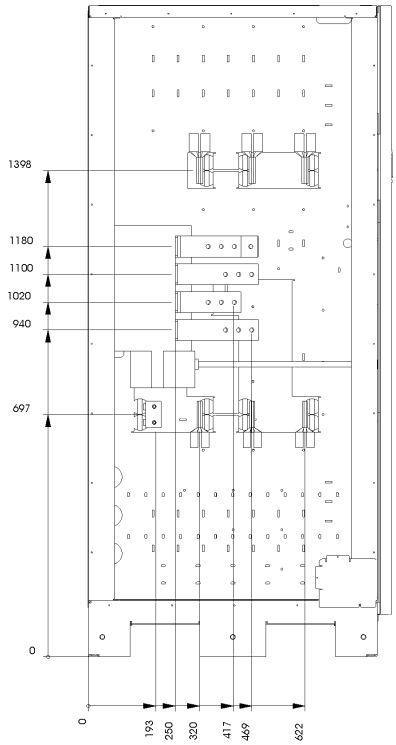


Figure 3-5 b, side view. UPS power terminal locations MBS version

3.4.2 Battery wiring

CAUTION

When sizing the battery system, do not exceed the internal battery charger capabilities. See Chapter 10, "Product specifications," for maximum battery charger currents.

To install wiring to connections:

1. If using a Powerware battery cabinet, proceed to Step 2; otherwise, proceed to Step 5.
2. Route and connect the battery cables between the UPS and battery cabinets in accordance with the instructions in the Powerware 9395 Integrated Battery Cabinet (Model IBC-L) installation manual. See Figure 3-3 through Figure 3-5 for wiring access information and terminal locations.
3. Connect the positive, negative, and ground DC power wiring from the battery cabinet to the UPS cabinet battery and ground terminals. See paragraph 2.2.2 on page 14 for wiring and termination requirements.
4. Proceed to Step 7.
5. Route and connect the battery cables between the UPS and the battery system. See Figure 3-3 through Figure 3-5 for wiring access information and terminal locations.
6. Connect the positive, negative, and ground DC power wiring from the battery system to the UPS cabinet battery and ground terminals. See paragraph 2.2.2 on page 14 for wiring and termination requirements.
7. After wiring the UPS system to the facility power and critical load, be sure to ground the system according to local and/or national electrical wiring codes.
8. If wiring interface connections, proceed to paragraph 3.5; otherwise, proceed to Step 9.
9. When all wiring is complete, reinstall the left front panel removed in paragraph 3.4.1 and secure with the retained hardware.

3.5 Installing interface connections

WARNING

Hazardous voltages are present near the user interface terminal area if the UPS is not totally disconnected.

3.5.1 TB1, TB2, and TB3 connections (other than TB1 battery interface connections)

NOTE

Interface wiring must be installed from the top of the UPS cabinet.

To install wiring to connections:

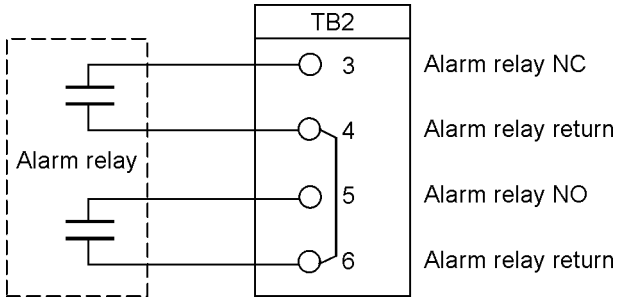
1. Verify the UPS system is turned off and all power sources are removed. See Chapter 5, “UPS Operating Instructions,” for shutdown instructions.
2. If not already accomplished, remove one top screw and two bottom screws securing the UPS left front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
3. Remove one top screw and two bottom screws securing the UPS center front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
4. Terminal block TB3 is accessible on the left side of the X-Slot communication bay. To gain access to terminal blocks TB1 and TB2 and the interface entry plates, loosen the screws securing the small top internal safety shield panel and remove the panel. This panel is to the right of the X-Slot Communication Bay (see Figure 3-7 on page 30).
5. Remove the UPS cabinet top interface entry plates to drill or punch holes (see Figure 3-3 on page 26).
6. Reinstall the entry plates.

WARNING

Do not directly connect relay contacts to the mains related circuits. Reinforced insulation to the mains is required.

---

7. To locate the appropriate terminals and review the wiring and termination requirements, see paragraph 2.2.2 on page 14, Table 3-1, and Figure 3-6 through Figure 3-9.
8. Route and connect the wiring.
9. If wiring TB1 battery interface connections, proceed to paragraph 3.5.2; if wiring the X-Slot connections only, proceed to paragraph 3.5.3; otherwise, proceed to Step 10.
10. When all wiring is complete, reinstall the small top internal safety shield panel and secure with the cabinet mounted screws.
11. Reinstall the left and center front panels removed in previous steps and secure with the retained hardware.



NOTE Alarm relay contacts have a maximum current rating of 5A and a switched voltage rating of 30 Vac and 28 Vdc.

NOTE Alarm relay normally-open and normally-closed return terminals are separated on the terminal board, but are electrically in common.

NOTE Do not directly connect relay contacts to the mains related circuits. Reinforced insulation to the mains is required.

NOTE Alarm relay wiring should be a minimum of .75 mm2.

Figure 3-6. Typical alarm relay connection

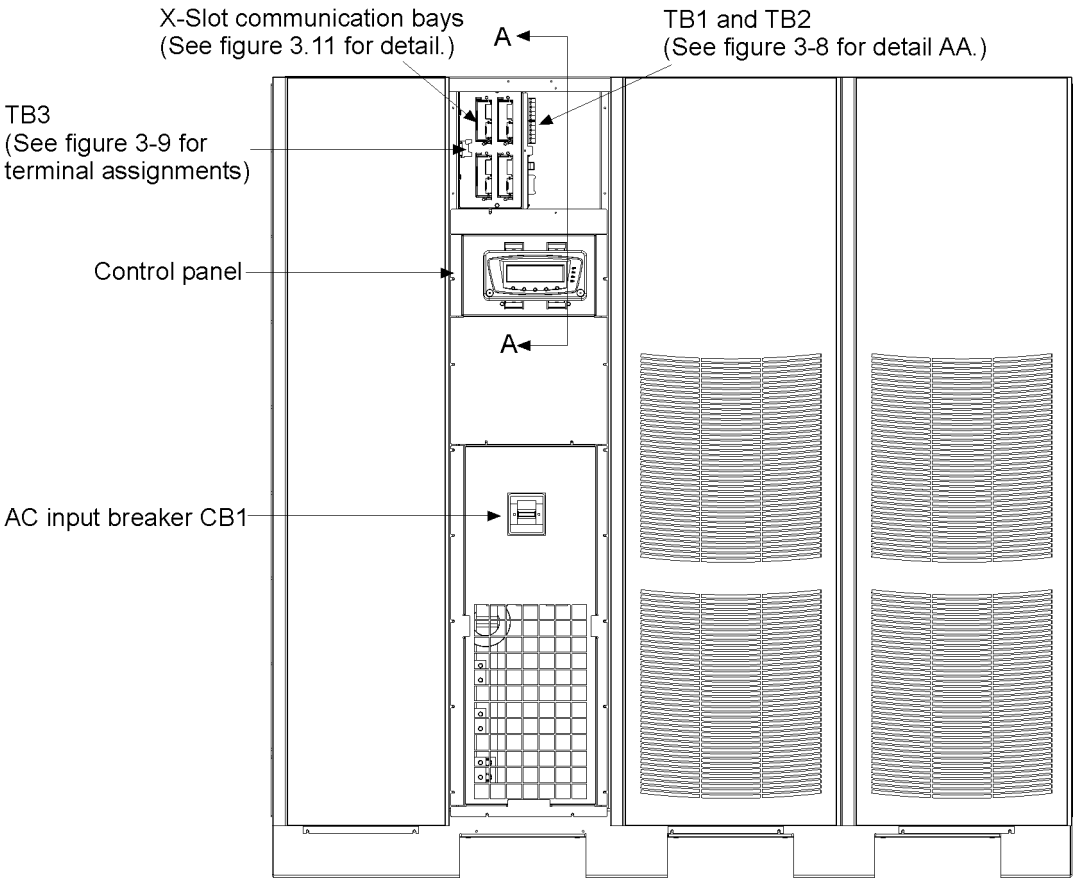


Figure 3-7. Interface terminal locations

Terminal TB1	Name	Descrition
1	Remote EPO NC	Dry contact used to active remote EPO of UPS.
2	Remote EPO return	
3	Remote EPO NO	
4	Remote EPO return	
5	Battery aux	
6	Battery aux return	
7	48 Vdc battery shunt trip +	
8	48 Vdc battery shunt trip -	
9	Not used	
10	Not used	
Terminal TB2	**Name**	**Descrition**
1	Pull chain	Back control for parallel operation.
2	Pull chain return	
3	Alarm relay NC	General purpose normally-open (NO) and normally-closed (NC) relay contacts.
4	Alarm relay return	
5	Alarm relay NO	
6	Alarm relay return	
7	Not used	
8	Not used	
9	Not used	
10	Not used	
Terminal TB3	**Name**	**Descrition**
1	Building alarm 1	Programmable UPS alarm. Activated by a remote dry contact closure.
2	Building alarm 1 return	
3	Building alarm 2	Programmable UPS alarm. Activated by a remote dry contact closure.
4	Building alarm 2 return	
5	Building alarm 3	Programmable UPS alarm. Activated by a remote dry contact closure.
6	Building alarm 3 return	
7	Building alarm 4	Programmable UPS alarm. Activated by a remote dry contact closure.
8	Building alarm 4 return	
9	Building alarm 5	Programmable UPS alarm. Activated by a remote dry contact closure.
10	Building alarm 5 return	

Table 3-1. TB1, TB2, and TB3 interface connections

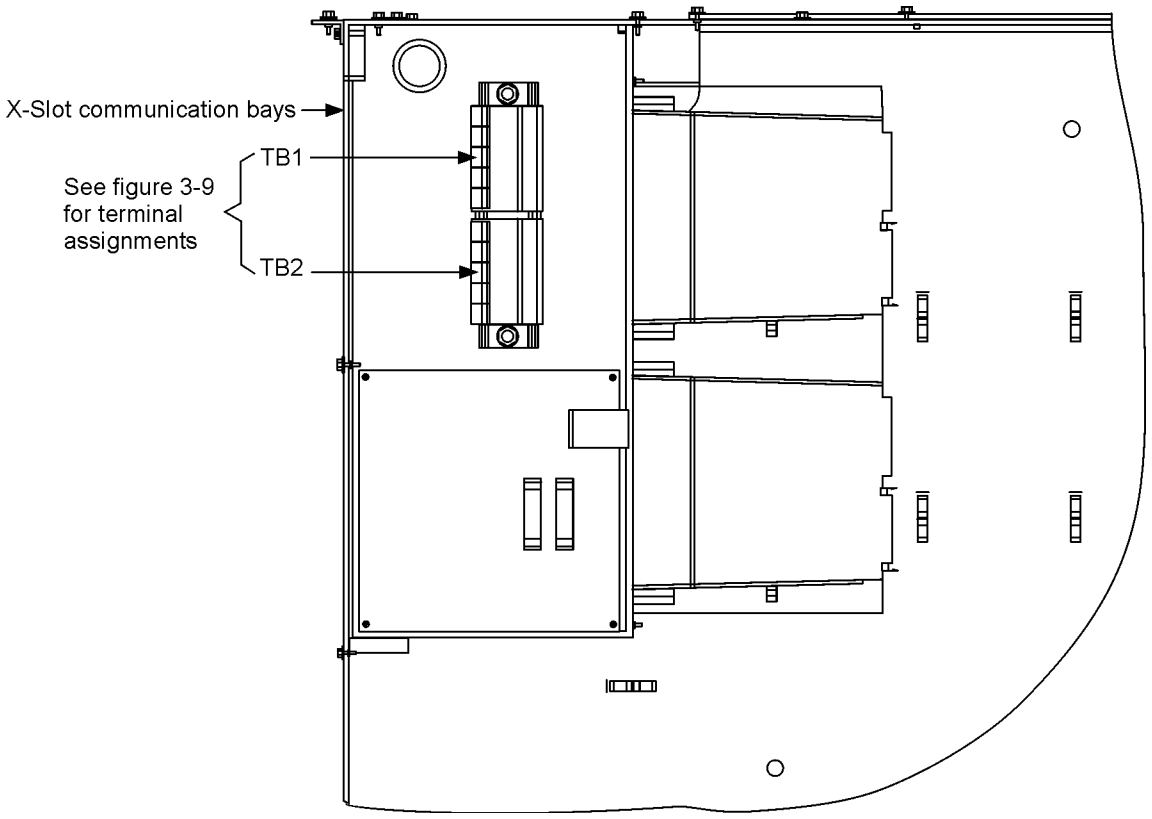
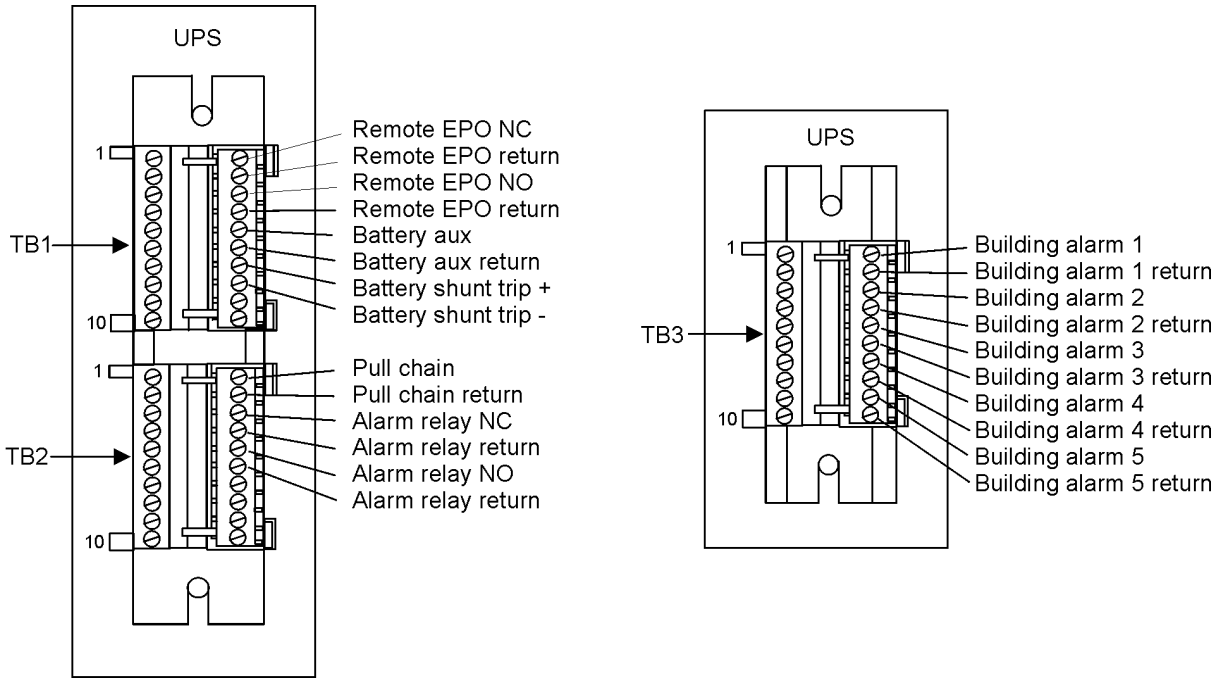


Figure 3-8. Interface terminal detail AA



NOTE All building alarm inputs require an isolated normally-open or normally-closed contact or switch (rated at 24 Vdc, 20 mA minimum) connected between the alarm input and common terminal as shown. Building alarm inputs can be programmed for use with either normally-open or normally-closed contacts. All control wiring and relay and switch contacts are customer-supplied.

NOTE The building alarms can be programmed to display the alarm functional name.

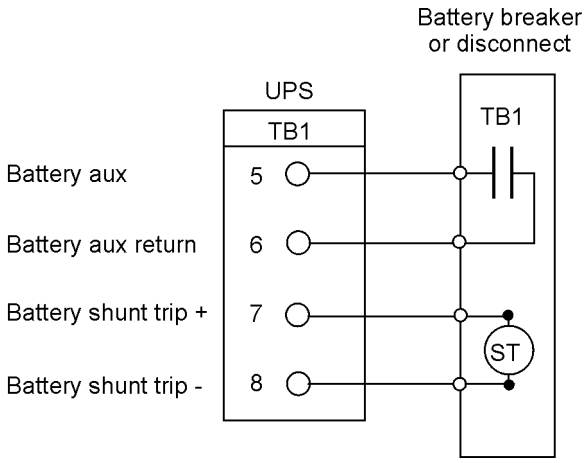
NOTE A jumper wire must be connected between pins 1 and 2 on TB1, if the normally-closed Remote EPO contact is not used.

Figure 3-9. Terminal blocks TB1, TB2, and TB3 connector assignments

3.5.2 TB1 battery interface connections

To install wiring to connections:

1. Verify the UPS system is turned off and all power sources are removed. See Chapter 6, "UPS operating instructions," for shutdown instructions.
2. If not already accomplished, remove one top screw and two bottom screws securing the UPS left front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
3. If not already accomplished, remove one top screw and two bottom screws securing the UPS center front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
4. To gain access to terminal blocks TB1 and the interface entry plates, loosen the screws securing the small top internal safety shield panel and remove the panel. This panel is to the right of the X-Slot Communication Bay (see Figure 3-7 on page 30).
5. To locate the appropriate terminals and review the wiring and termination requirements, see paragraph 2.2.2 on page 14, Table 3-1, and Figure 3-7 through Figure 3-10.
6. If battery cabinets are installed attached to the UPS cabinet, proceed to Step 7; if battery cabinets are installed separated from the UPS cabinet or a battery system is being used, proceed to Step 10.
7. Route the Shunt trip and Aux wiring harness supplied with the battery cabinet from the battery cabinet to the UPS cabinet. Refer to the Powerware 9395 Integrated Battery Cabinet (Model IBC-L) installation manual for battery cabinet wiring access information.
8. Connect the wiring to TB1 terminals.
9. Proceed to Step 15.
10. Remove the UPS cabinet interface entry plates to drill or punch holes (see Figure 3-3 on page 26).
11. Reinstall the interface entry plates.
12. Route the Shunt trip and Aux wiring from the battery cabinet or battery system breaker to the UPS.
13. Connect the wiring to the TB1 terminals.
14. When all wiring is complete, reinstall the small top internal safety shield panel and secure with the cabinet mounted screws.
15. If wiring X-Slot connections, proceed to paragraph 3.5.3; otherwise, proceed to Step 16.
16. Reinstall the left and center front panels removed in previous steps and secure with the retained hardware.



NOTE Battery Aux and DC Shunt Trip wiring should be a minimum of 1.5 mm^2.

Figure 3-10. Typical battery interface connection

3.5.3 X-Slot connections

NOTE

LAN and telephone drops for use with X-Slot cards must be provided by the customer.

NOTE

When installing internal wiring to X-Slot terminals, route the wiring through the internal opening in the X-Slot communication bay.

For installation and setup of an X-Slot card, please contact Eaton Corporation.

To install wiring to connections:

1. If not already installed, install the LAN and telephone drops.
2. If not already accomplished, remove one top screw and two bottom screws securing the UPS center front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.
3. Remove the UPS cabinet interface entry plates to drill or punch holes (see Figure 3-3 on page 26).
4. Reinstall the interface entry plates.
5. Route and install the LAN, telephone, and other cables to the appropriate X-Slot cards. See Figure 3-7 and Figure 3-11 for X-Slot location.
6. When all wiring is complete, reinstall the front panel removed in previous steps and secure with the retained hardware.
7. Refer to the manual supplied with the X-Slot card for operator instructions.

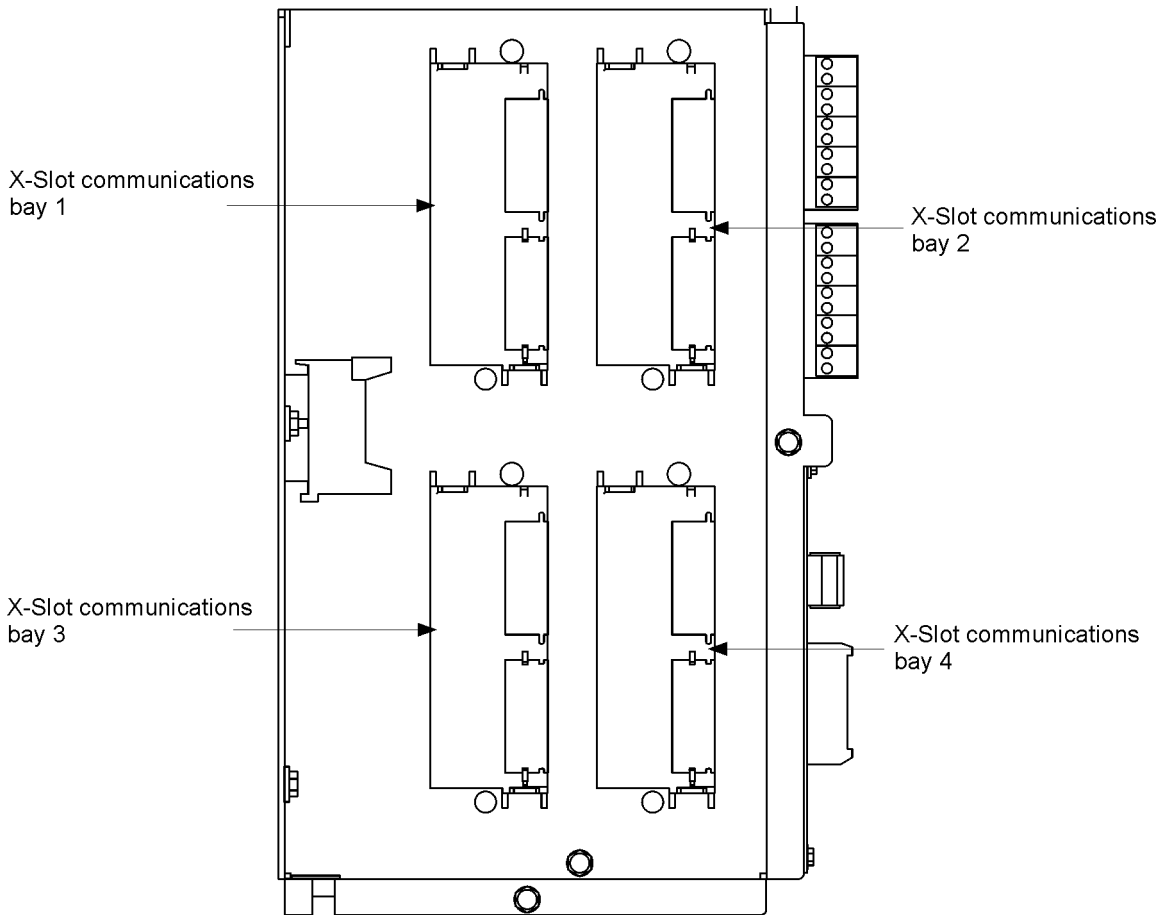


Figure 3-11. X-Slot communication bays

3.6 Installing a remote EPO switch

NOTE

Remove the UPS cabinet interface entry plates to punch holes (see Figure 3-3).

NOTE

This switch must be a dedicated switch not tied into any other circuits.

NOTE

This procedure is intended to be used for the installation of the Powerware remote EPO switch. If installing another manufacturer's switch, only use this procedure as a guide.

A remote EPO switch can be used in an emergency to shut down the UPS and remove power to the critical load from a location away from where the UPS is installed. Figure 3-12 shows a remote EPO switch.

1. Securely mount the remote EPO switch. Recommended locations include operator's consoles or near exit doors. See Figure 2-7 for enclosure dimensions and wiring knockouts.
2. Verify the UPS system is turned off and all power sources are removed. See Chapter 5, "UPS operating instructions" for shutdown instructions.
3. Remove one top screw and two bottom screws securing the UPS center front panel (see Figure 3-1). Lift the panel straight up to remove from the panel hanger bracket at the top of the cabinet.

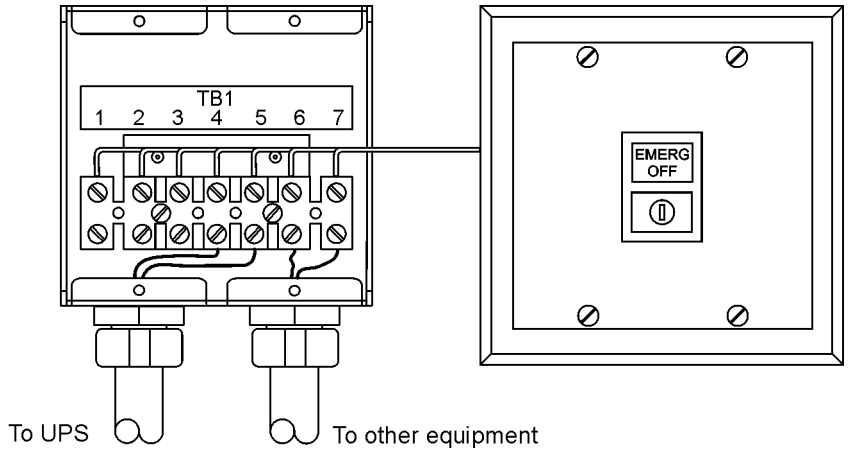
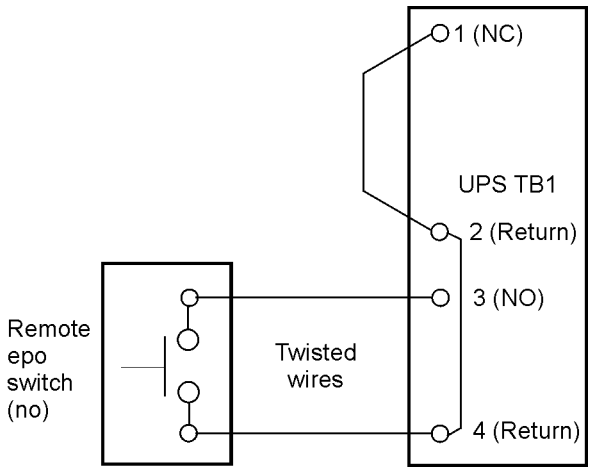


Figure 3-12. Remote EPO switch

4. To gain access to terminal blocks TB1 and TB2 and the interface entry plates, loosen the screws securing the small top internal safety shield panel and remove the panel. This panel is to the right of the X-Slot communication bays (see Figure 3-7 on page 30).
5. Remove the UPS cabinet interface entry plates to drill or punch holes (see Figure 3-3 on page 26).
6. Reinstall the interface entry plates.
7. To locate the appropriate terminals and review the wiring and termination requirements, see paragraph 2.2.2 on page 14, Table 3-1, and Figure 3-7 through Figure 3-9.
8. Route and connect the wiring as shown in Table 3-2 and Figure 3-13.
9. If the normally-closed Remote EPO TB1 connection in the UPS is not used, connect a jumper wire between pins 1 and 2 on TB1.

From remote EPO switch	To customer interface Terminal board TB1 in UPS cabinet	Remarks
TB1-4	TB-3	Twisted wires (2) 2.5mm^2 0.75mm^2
TB1-5	TB-4	

Table 3-2. Remote EPO wire terminations

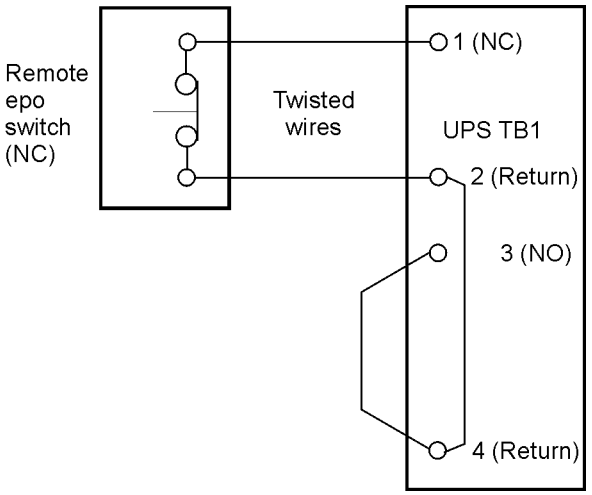


Note Remote EPO switch rating is 24 Vdc, 1 A minimum.

Note Remote EPO normally-open and normally-closed return terminals are separated on the terminal board, but are electrically in common.

Figure 3-13. Normally-Open remote EPO switch wiring

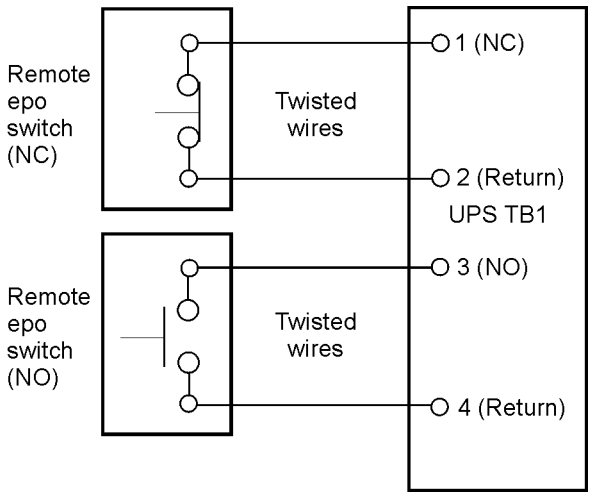
10. If you are installing multiple remote EPO switches, wire additional switches in parallel with the first remote EPO.
11. If required, install wiring from the remote EPO switch to the trip circuitry of the upstream protective devices. A normally-open (NO) contact is provided between terminals 6 and 7 of the remote EPO switch, as shown in Figure 3-12. Remote EPO switch wiring must be in accordance with UL Class II requirements.
12. When all wiring is complete, reinstall the small top internal safety shield panel and secure with the cabinet mounted screws.
13. Reinstall the center front panel removed in previous steps and secure with the retained hardware.
14. Figure 3-14 and Figure 3-15 show alternative methods of connecting a remote EPO switch if using another manufacturer's switch.



Note Remote EPO switch rating is 24 Vdc, 1 A minimum.

Note Remote EPO normally-open and normally-closed return terminals are separated on the terminal board, but are electrically in common.

Figure 3-14. Normally closed remote EPO switch wiring



Note Remote EPO switch rating is 24 Vdc, 1 A minimum.

Note Remote EPO normally-open and normally-closed return terminals are separated on the terminal board, but are electrically in common.

Figure 3-15. Normally closed and normally open remote EPO switch wiring

3.7 Initial startup

Startup and operational checks must be performed by an authorized Eaton Customer Service Engineer, or the warranty terms specified on page W-1 become void. This service is offered as part of the sales contract for the UPS. Contact service in advance (usually a two-week notice is required) to reserve a preferred startup date.

3.8 Completing the installation checklist

The final step in installing the UPS system is completing the following installation checklist. This checklist ensures that you have completely installed all hardware, cables, and other equipment. Complete all items listed on the checklist to ensure a smooth installation. Make a copy of the Installation Checklist before filling it out, and retain the original. If installing a parallel system, complete the parallel system installation checklist in addition to the installation checklist.

After the installation is complete, your service representative must verify the operation of the UPS system and commission it to support the critical load. The service representative cannot perform any installation tasks other than verifying software and operating setup parameters. Service personnel may request a copy of the completed Installation Checklist to verify all applicable equipment installations have been completed.

NOTE

The installation checklist MUST be completed prior to starting the UPS system for the first time.

Installation checklist

- ❒ All packing materials and restraints have been removed from each cabinet.
- ❒ Each cabinet in the UPS system is placed in its installed location.
- ❒ A cabinet grounding/mounting kit is installed between any cabinets that are bolted together.
- ❒ All conduits and cables are properly routed to the UPS and any ancillary cabinets.
- ❒ All power cables are properly sized and terminated.
- ❒ Neutral conductors are installed or bonded to ground as per requirements.
- ❒ Battery cables are terminated on E4 (+) and E5 (–).
- ❒ Battery Shunt trip and Aux contact signal wiring is connected from the UPS to the battery breaker.
- ❒ LAN and telephone drops are installed.
- ❒ All telephone and LAN connections have been completed.
- ❒ A ground conductor is properly installed.
- ❒ Air conditioning equipment is installed and operating correctly.
- ❒ The area around the installed UPS system is clean and dust-free. (It is recommended that the UPS be installed on a level floor suitable for computer or electronic equipment.)
- ❒ Adequate workspace exists around the UPS and other cabinets.
- ❒ Adequate lighting is provided around all UPS equipment.
- ❒ A 230 Vac service outlet is located within 7.5 meters of the UPS equipment.
- ❒ The Remote Emergency Power-off (REPO) device is mounted in its installed location and its wiring is terminated inside the UPS cabinet.
- ❒ The normally-closed (NC) Emergency Power-off contact (pins 1 and 2 on TB1) is jumpered if not used.
- ❒ Alarm relays and building alarms are wired appropriately. (OPTIONAL)
- ❒ A remote battery disconnect control is mounted in its installed location and its wiring is terminated inside the UPS and battery cabinet. (OPTIONAL)
- ❒ Accessories are mounted in installed locations and wiring is terminated inside the UPS cabinet. (OPTIONAL)
- ❒ The debris shield covering the UPS cabinet ventilation grill is removed.
- ❒ Startup and operational checks are performed by an authorized Eaton Customer Service Engineer.

4 Understanding UPS operation

4.1 Looking inside the UPS system

The Powerware 9395 UPS is a continuous-duty, solid-state, transformerless (at 400 Vac), three-phase, true online system that provides conditioned and uninterruptible AC power to the UPS system's output and critical load. The basic system consists of a rectifier, battery converter, inverter, monitoring/operation control panel, integrated communication server, and digital.

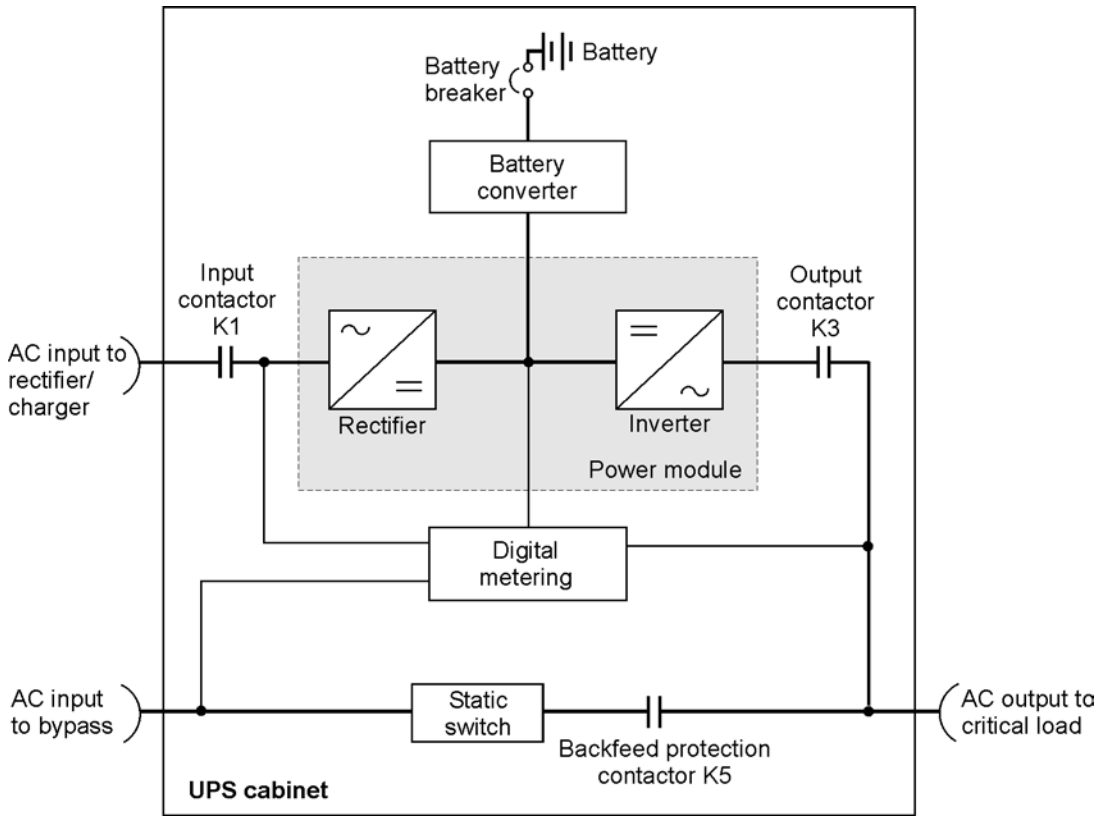


Figure 4-1. Main elements of the UPS system

If utility power is interrupted or falls outside the parameters specified in Chapter 10, "Product specifications," the UPS uses a backup battery supply to maintain power to the critical load for a specified period of time or until the utility power returns. For extended power outages, the UPS allows you to either transfer to an alternative power system (such as a generator) or shut down your critical load in an orderly manner. The emergency bypass consists of a continuous-duty static switch and backfeed protection contactor K5. The backfeed protection contactor is located in series with the static switch. For manual transfers to bypass, the static switch is also used. The static switch is armed and ready during both types of transfers.

4.2 Modes

The Powerware 9395 UPS supports a critical load in three different modes of operation. The UPS can automatically use all three modes, as required. The standard operation modes are:

- In Normal mode, the critical load is supplied by the inverter, which derives its power from rectified utility AC power. In this mode, the battery charger also provides charging current for the battery, if needed.
- In Battery mode, the battery provides DC power, which maintains inverter operation. The battery supports the critical load.
- In Bypass mode, the critical load is directly supported by utility power. The following paragraphs describe the differences in the three UPS operating modes, using block diagrams to show the power flow during each mode of operation.

4.2.1 Normal mode

Figure 4-2 shows the path of electrical power through the UPS system when the UPS is operating in normal mode.

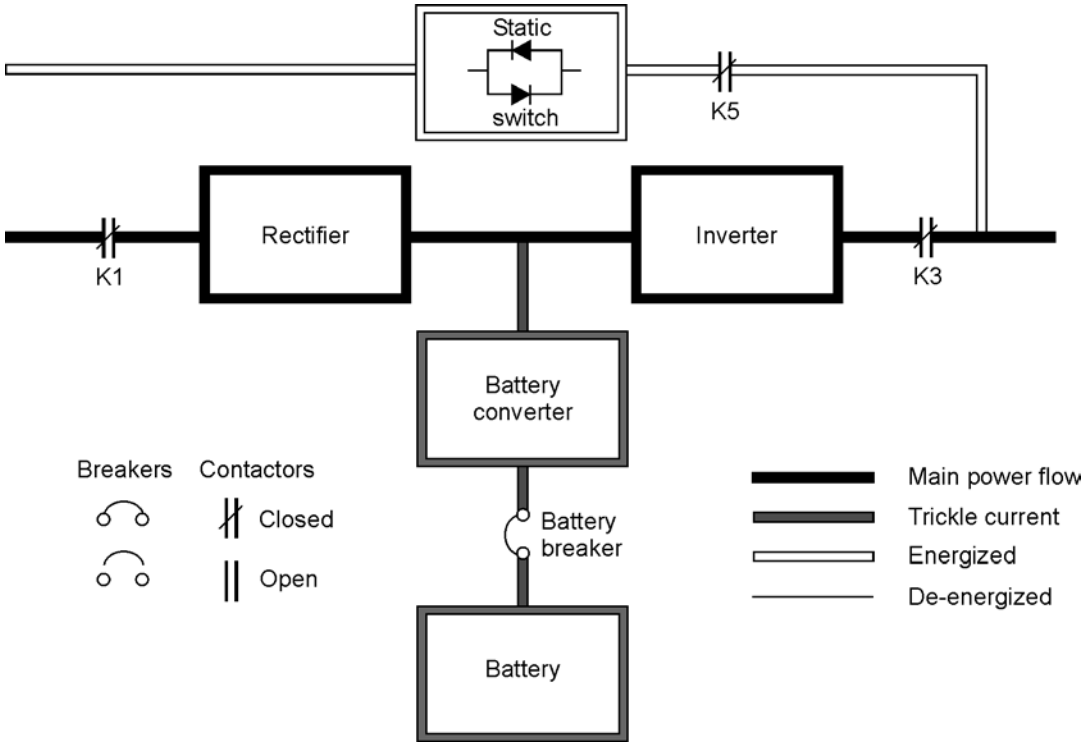


Figure 4-2. Path of current through the UPS in normal mode

During normal UPS operation, power for the system is derived from a utility input source through the rectifier input contactor K1. The front panel displays "Normal," indicating the incoming power is within voltage and frequency acceptance windows. Three-phase AC input power is converted to DC using IGBT devices to produce a regulated DC voltage to the inverter. The battery is charged directly from the regulated rectifier output through a buck or boost DC converter, depending on whether the system voltage and the size of the battery string attached to the unit.

The battery converter derives its input from the regulated DC output of the rectifier and provides either a boosted or bucked regulated DC voltage charge current to the battery. The battery is always connected to the UPS and ready to support the inverter should the utility input become unavailable.

The inverter produces a three-phase AC output to a customer's load without the use of a transformer. The inverter derives regulated DC from the rectifier and uses IGBT devices and pulse-width modulation (PWM) to produce a regulated and filtered AC output. The AC output of the inverter is delivered to the system output through the output contactor K3.

If the utility AC power is interrupted or is out of specification, the UPS automatically switches to Battery mode to support the critical load without interruption. When utility power returns, the UPS returns to Normal mode.

If the UPS becomes overloaded or unavailable, the UPS switches to Bypass mode. The UPS automatically returns to Normal mode when the overload condition is cleared and system operation is restored within specified limits.

If the UPS suffers an internal failure, it switches automatically to Bypass mode and remains in that mode until the failure is corrected and the UPS is back in service.

4.2.2 Bypass mode

The UPS automatically switches to bypass mode if it detects an overload, load fault, or internal failure. The bypass source supplies the commercial AC power to the load directly. Figure 4-3 shows the path of electrical power through the UPS system when operating in Bypass mode.

CAUTION

The critical load is not protected while the UPS is in Bypass mode.

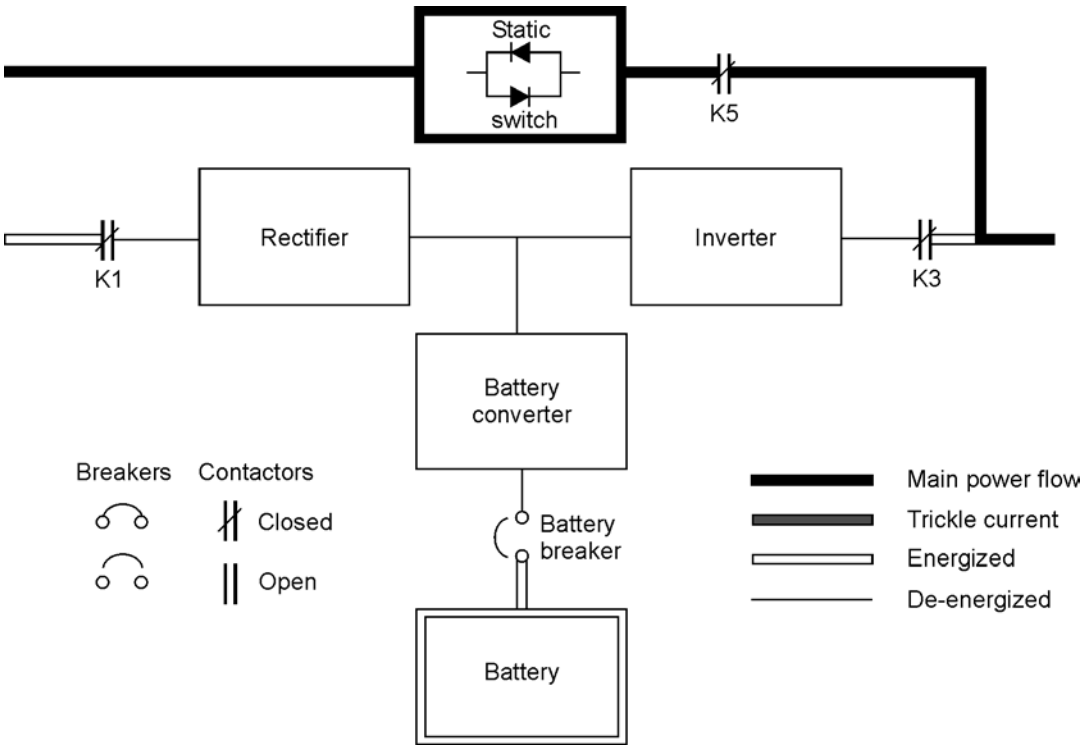


Figure 4-3. Path of current through the UPS in bypass mode

In bypass mode, the output of the system is provided with three-phase AC power directly from the system input. While in this mode, the output of the system is not protected from voltage or frequency fluctuations or power outages from the source. Some power line filtering and spike protection is provided to the load but no active power conditioning or battery support is available to the output of the system in the bypass mode of operation.

The internal bypass is comprised of a solid-state, silicon-controlled rectifier (SCR) static switch (SSW) and a backfeed protection contactor K5. The static switch is rated as a continuous-duty device that is used anytime the inverter is unable to support the applied load. The static switch is wired in series with the backfeed protection contactor, and together they are wired in parallel with the rectifier and inverter. The static switch, being an electronically-controlled device, can be turned on immediately to pick up the load from the inverter while the inverter output contactor K3 opens to isolates the inverter. The backfeed protection contactor is normally always closed, ready to support the static switch unless the bypass input source becomes unavailable.

4.2.3 Battery mode

The UPS automatically transfers to battery mode if a utility power outage occurs, or if the utility power does not conform to specified parameters. In battery mode, the battery provides emergency DC power that the inverter converts to AC power.

Figure 4-4 shows the path of electrical power through the UPS system when operating in battery mode.

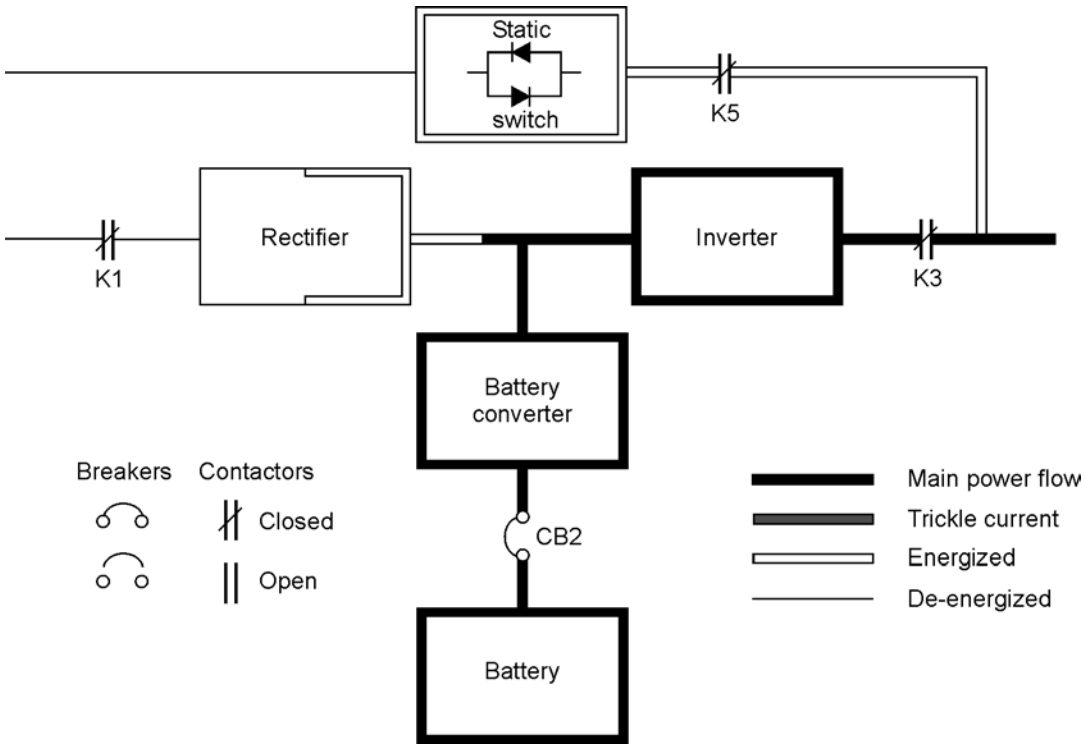


Figure 4-4. Path of current through the UPS in battery mode

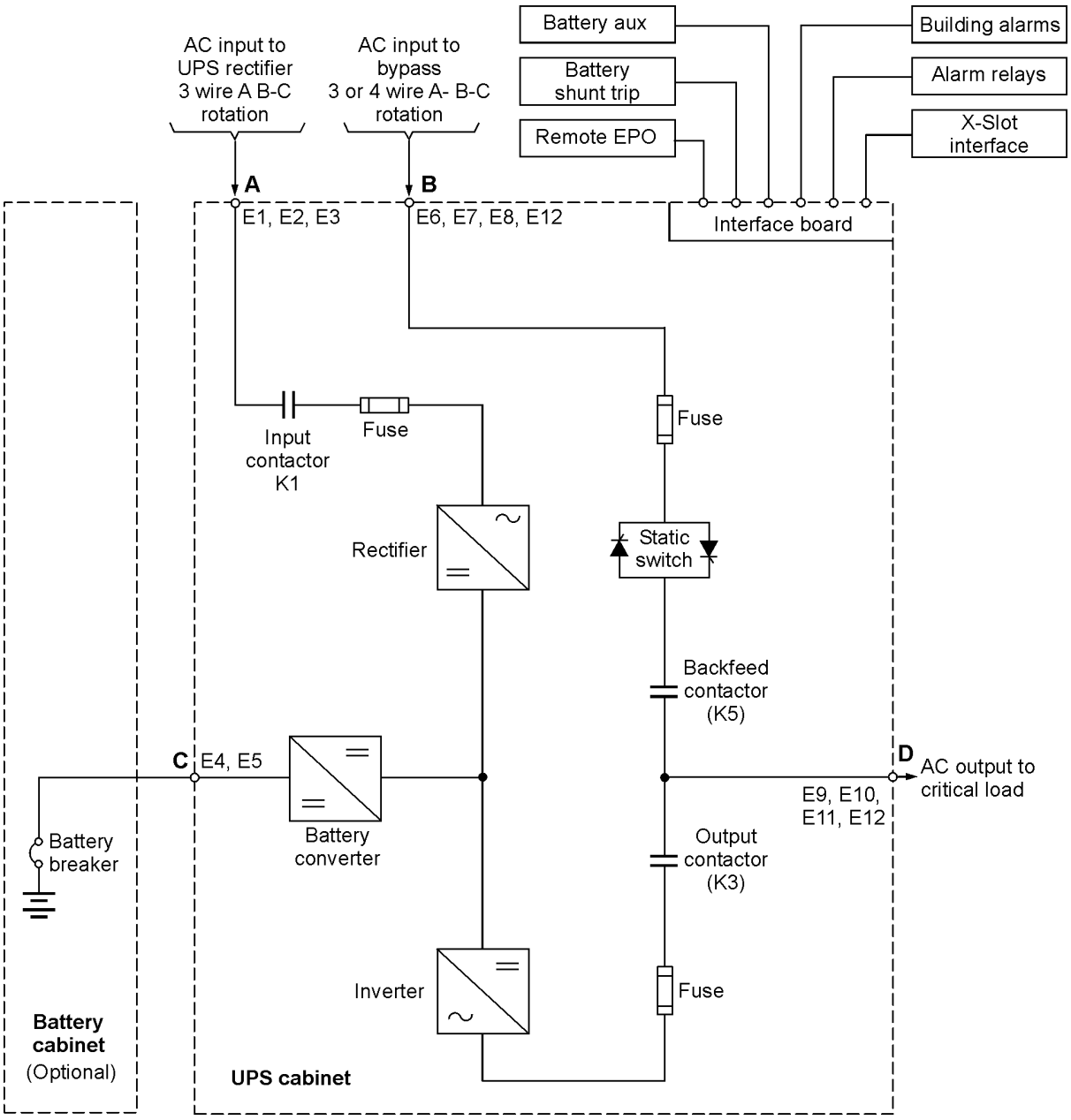
During a utility power failure, the rectifier no longer has an AC utility source from which to supply the DC output current required to support the inverter. The input contactor K1 opens and the battery instantaneously supplies energy to the battery converter. The converter either bucks or boosts the voltage so that the inverter can support the customer's load without interruption. If bypass is common with the rectifier input, the backfeed protection contactor K5 also opens. The opening of contactors K1 and K5 prevent system voltages from bleeding backwards through the static switch and rectifier snubber components and re-entering the input source.

If the input power fails to return or is not within the acceptance windows required for normal operation, the battery continues discharging until a DC voltage level is reached where the inverter output can no longer support the connected loads. When this event occurs, the UPS issues another set of audible and visual alarms indicating SHUTDOWN IMMINENT. Unless the rectifier has a valid AC input soon, the output can be supported for only two minutes before the output of the system shuts down. If the bypass source is available, the UPS transfers to bypass instead of shutting down.

If at any time during the battery discharge the input power becomes available again, contactors K1 and K5 close and the rectifier begins to supply DC current to the converter and inverter. At this point, the unit returns to normal mode. Depending on the total load and the duration of the battery discharge, battery current limit alarms may be seen for a short time due to the current required to recharge the battery.

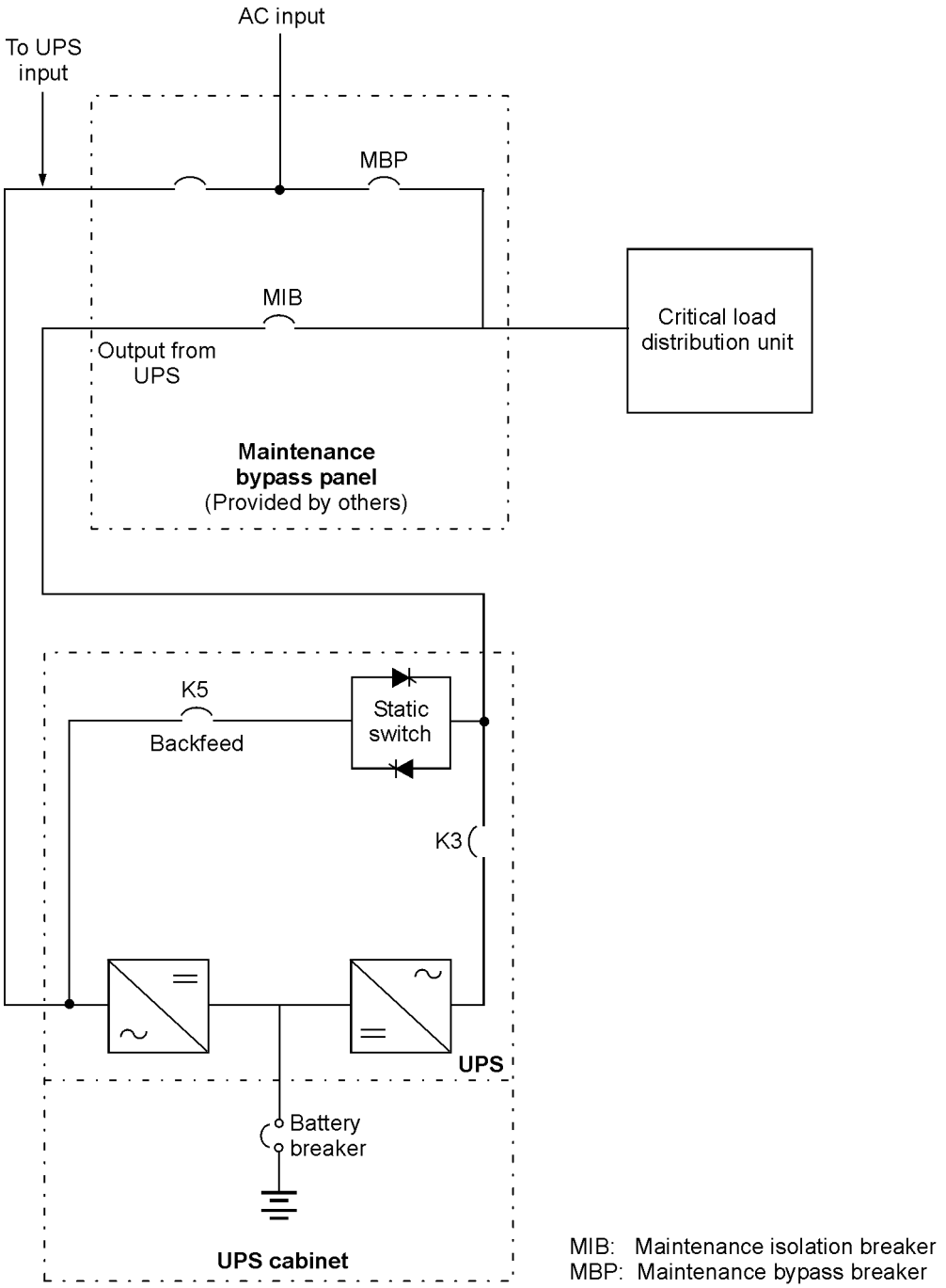
4.3 UPS system one line configurations

One line drawing	UPS model	Voltage		System type
		Input	Output	
Figure 4-5	9395-450/550	400	400	Single module – Reverse transfer dual-feed
Figure 4-6	9395-450/550	400	400	Single module – reverse transfer dual-feed with typical maintenance bypass panel



NOTE If the load requires a neutral, a bypass source neutral must be provided. If the load does not require a neutral and there is no neutral conductor connected at the bypass input, a neutral to ground bonding jumper must be installed. DO NOT install both a source neutral and a bonding jumper.

Figure 4-5. Powerware 9395 450–550 kVA UPS system, 400 V input and 400 V output dual-feed



NOTE If installing, as part of the UPS system, a maintenance bypass without a rectifier input breaker, a minimum of two separate feeds with upstream feeder breakers, or one feed with two upstream feeder breakers, must be provided: one for the UPS and one for the maintenance bypass input. DO NOT use one feed or a single-feeder breaker to supply both the UPS and the maintenance bypass.

Figure 4-6. Typical maintenance bypass panel

5 UPS operating instructions

This section describes how to operate the UPS.

NOTE

Before starting the UPS, ensure all installation tasks are complete and a preliminary startup has been performed by authorized service personnel. The preliminary startup verifies all electrical interconnections to ensure the installation was successful and the system operates properly.

NOTE

Read this section of the manual and have thorough knowledge of UPS operation before attempting to operate any of the controls.

NOTE

The UPS displays two minutes of battery runtime at the initial startup. After a 24-hour charging period, the UPS automatically runs a battery test and the correct battery runtime displays.

5.1 UPS controls and indicators

The controls and indicators identified and described in this section are used to control and monitor UPS operation. Figure 6-1 shows the UPS controls and indicators.

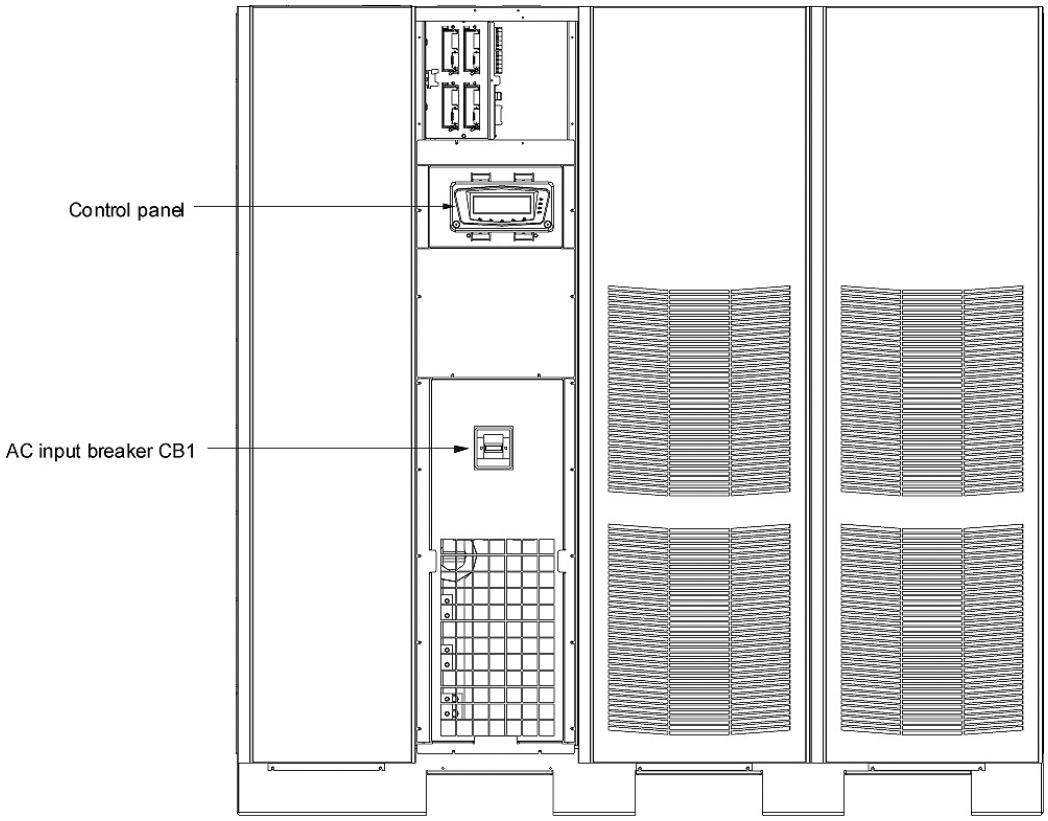


Figure 5-1. Powerware 9395 450–550 kVA UPS controls and indicators

5.1.1 Control panel

The Control Panel is used to set up and control the UPS, and to monitor UPS operation. For a description of the UPS control panel functions, see paragraph 5.2.

5.1.2 Circuit breakers

Circuit breaker (CB1) is used to control the AC input to the UPS rectifier.

5.2 Using the control panel

The following paragraphs describe the UPS control panel, including controls and indicators, and how to monitor UPS operation. The control panel (see Figure 5-2) is located on the front door of the UPS.

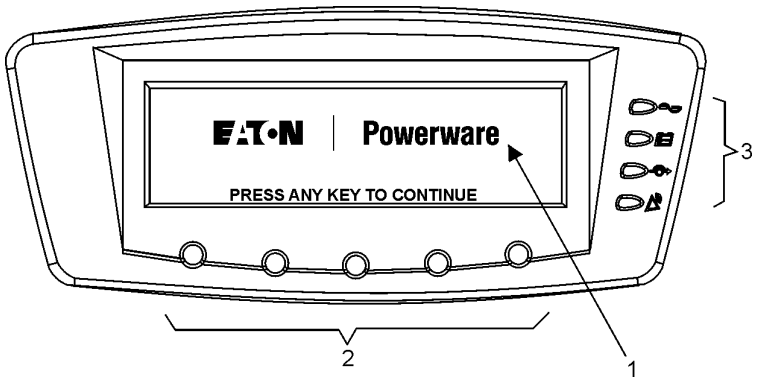


Figure 5-2. UPS control panel

The control panel consists of the following:

- A liquid crystal display (LCD) (1)
- A horizontal row of pushbutton switches (2)
- A vertical column of status indicators (3). See paragraph 5.2.1.

The following paragraphs describe using the UPS control panel to monitor the UPS. See paragraph 6.3 for use of the operational controls.

When the unit powers up, the screen displays the Eaton | Powerware logo as shown in Figure 5-2. To advance to the main menu and mimic screen, press any control panel pushbutton once.

5.2.1 Status indicators

The four symbols on the right side of the control panel are status indicators. They are colored light emitting diode (LED) lamps, and they work in conjunction with the alarm horn to let you know the operating status of the UPS. The Table 5-1 shows the status indicators and provides a functional description.

Indicator	Status	Descritions
Green	On	The UPS is operating normally. The power module is supplying power to the critical load.
	Off	The UPS is turned off.
Yellow	On	The UPS is in Battery mode. Because Battery mode is a normal condition of the UPS, the Normal indicator also remains illuminated.
Yellow	On	The UPS is in Bypass mode. The critical load is supported by the bypass source. The Normal indicator is not illuminated when the system is in Bypass mode.
Red	On	The UPS has an active alarm and requires immediate attention. The LCD shows the highest priority active alarms. All alarms are accompanied by an audible horn. To silence the horn, press any control panel pushbutton once. The Alarm indicator may be illuminated along with other indicators.
	Flashing	There is a new UPS alarm condition. The indicator flashes until acknowledged by pressing any control panel pushbutton once.

Table 5-1. Status indicators

For more information about audible horns, see “System event horns” on page 63.

5.2.2 Using the LCD and pushbuttons

The LCD on the control panel provides an operator interface with the UPS system. Figure 5-3 identifies the display areas discussed in the following sections.

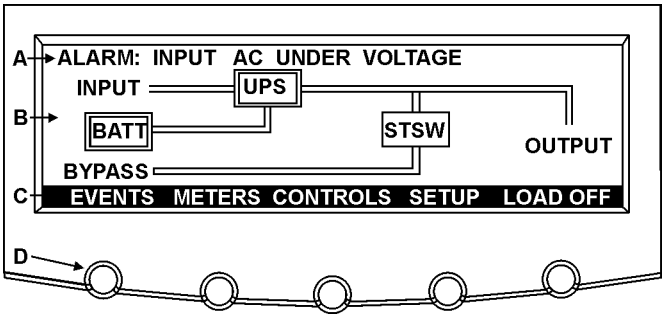


Figure 5-3. Parts of the LCD

A The *UPS status* area automatically scrolls between the Eaton Corporation model number, current date and time, active alarms, active notices, and load percent and battery runtime for the UPS. The top line of display blinks while scrolling when the system needs attention. Some notices and alarms may be accompanied by an audible horn. To silence the horn, press any control panel pushbutton once. Shown is a typical alarm message. For more information about alarms and notices, see Chapter 6, "Responding to system events."

B The *information area* contains data about UPS status and operations.

C The *menu bar* lists the titles of the available screens. To select a screen, press the pushbutton underneath the desired screen.

D The *navigation pushbuttons* function depending on the screen displayed. Use the pushbuttons to select menu screens or scroll through available screens. The LCD options above the pushbuttons indicate each pushbutton's function.

You can use the LCD and the pushbuttons to:

- Look at a log of UPS events (alarms, notices, and commands) (see paragraph 5.2.5)
- Monitor UPS operation (see paragraph 5.2.5)
- Set UPS parameters (see paragraph 5.2.5)
- Control UPS operation (see paragraphs 5.2.6 and 5.2.7)

After approximately 30 minutes, the display screen darkens. To restore the screen, press any pushbutton once.

5.2.3 Using the menu

The UPS menu bar allows you to display data in the information area to help you monitor and control UPS operation. Table 5-2 shows the basic menu structure.

Menu option	Description
EVENTS	Displays the list of active system events and a historical log of system events.
METERS	Displays performance meters for the system or critical load.
CONTROLS	Displays the System Controls screen.
SETUP	Allows you to set the display contrast, set the date and time for the time stamp, configure the UPS serial communication ports, and view the firmware version numbers.
LOAD OFF	De-energizes the critical load and powers down the UPS.
ESC	ESC returns toMainMenu andMimic screen from the Events, Meters, Controls, or Setup screens. Returns to the main System Setup Level screen from a setup submenu.
	Return arrow acknowledges or executes a command, or saves a setting.
	Up or down arrows scroll through screens and lists or highlight settings.
	Left or right arrows select or adjust settings displayed on the screen.

Table 5-2. Display function menu map

5.2.4 Mimic screen

Figure 5-4 shows the Main Menu and Mimic screen. To select the Mimic screen from the Events, Meters, Controls, or Setup screens, press the ESC pushbutton on the current menu bar.

The Mimic screen shows the internal components of the UPS cabinet and a real-time graphical representation of the operating status of the system.

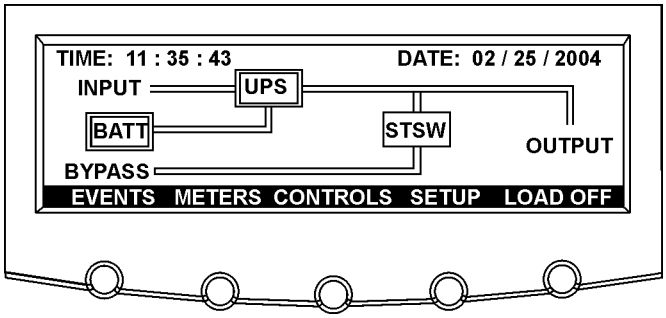


Figure 5-4. Main menu and Mimic screen (normal mode)

5.2.5 Display menu operation

Table 5-3 describes the menu functions and provides instructions to access and use the menu screens.

Function	Subfunction	Operation
Events		Press the EVENTS pushbutton on the main menu bar or History menu bar to display a listing of all system events that are currently active. The most recent event is listed first. As events clear, they are removed from the Active System Events listing. To scroll through the events, press the up or down arrow pushbuttons on the menu bar.

Function	Subfunction	Operation
History		Press the HISTORY pushbutton on the Active Events menu bar to display the History Log. The History Log lists up to the 500 system events in chronological order, with the most recent event listed last (once 500 is reached, the earliest event is overwritten). The end of the log (the most recent events) appears when you display the screen; scroll upward to view older event listings. To scroll through the events, press the up or down arrow pushbuttons on the menu bar. To return to the Active Events screen, press the EVENTS pushbutton on the menu bar.
Meters		The Meter screens show the UPS meter readings for the unit. The default voltage displayed on these screens is phase-to-neutral. However, an authorized Eaton Customer Service Engineer can change the screens to display the voltage phase-to-phase (A-B, B-C, C-A). Press the METERS pushbutton on the main menu bar to display the Unit Meter screens. To scroll through the meter screens, press the up or down arrow pushbuttons on the menu bar. The current UPS readings are displayed in the information area of the screen.
	Output	The Output screen shows output voltage (phase-to-neutral), output current (each phase), and frequency being supplied by the UPS, as well as the kVA, kW, and power factor measurements.
	Input	The Input screen shows input voltage (phase-to-neutral), input current (each phase), and frequency of the incoming utility source, as well as the kVA, kW, and power factor measurements.
	Bypass	The Bypass screen shows the bypass input voltage (phase-to-neutral), input current (each phase), and frequency of the incoming utility source, as well as the kVA, kW, and power factor measurements.
	Battery	The Battery screen displays the battery voltage (Vdc), the battery current (Idc), the minutes of battery time remaining, and battery temperature. Battery temperature must be set up by an authorized Eaton Customer Service Engineer. When battery life decreases to less than 20%,Check Battery is displayed.
	Output Current	The Output Current Screen displays a real-time bar graph of the output current of the UPS. The graph shows the current for each phase.
Battery Discharge Log Summary		The Battery Discharge Log Summary collects information when the unit is on battery. The screen displays the total number of times since the last log reset that the unit has transferred to battery. It also displays the date of the last log reset, the average time spent on battery per event, and the total time on battery since the last reset. Press the METERS pushbutton on the main menu bar to display the Unit Meter screens. Scroll through the meter screens using the up or down arrow pushbuttons on the menu bar until the Battery Discharge Log Summary screen is displayed.
Battery Discharge Log		The Battery Discharge Log screen displays the individual log entries including the date and time of the event, how long it was on battery, the unit load when the event occurred, and the end voltage of the battery for that discharge period. If no events have occurred, the screen will display LOG EMPTY. Press the LOG pushbutton on the Battery Discharge Log Summary menu bar to display the Battery Discharge Log screen. To scroll through the individual events, press the up or down arrow pushbuttons on the menu bar. To return to the Battery Discharge Log Summary screen, press the SUMMARY pushbutton on the menu bar. To clear the Battery Discharge Log, press the RESET pushbutton on the menu bar.
kW Demand Log Summary		The kW demand log collects information on events where the unit load exceeds a user-defined kW limit within a user-defined time interval. The user can choose a time period up to 9999 minutes and a load limit up to 9999 kW. If the limit is exceeded within a given time period a log event is created. The kW Demand Log Summary screen displays the number of total times the limit has been exceeded since the last log reset, the date of the last log reset, the maximum kW reading, and the total time over the limit. It also displays the average kW over the limit and an estimated number of kWh used over the limit. Both of these values are calculated using the difference between the actual measurement reading and the user-defined limit level. For example, during a 60-minute interval if the limit is set at 10 kW and the measurement is a constant 15 kW for the entire period, the average kW over would be 5 kW and the total kWh used over the limit would be 5 kWh. Press the METERS pushbutton on the main menu bar to display the Unit Meter screens. Scroll through the meter screens using the up or down arrow pushbuttons on the menu bar until the kWDemand Log Summary screen is displayed.

Function	Subfunction	Operation
kW Demand Log		The kW Demand Log screen displays the individual log entries, including the interval date and time frame, the maximum reading during the interval, the total time over limit during the interval, an estimated number of total kWh used during the interval, and the number of times over limit during the interval. If no events have occurred, the screen displays LOG EMPTY. Press the LOG pushbutton on the kW Demand Log Summary menu bar to display the kW Demand Log screen. To scroll through the individual events, press the up or down arrow pushbuttons on the menu bar. To return to the kW Demand Log Summary screen, press the SUMMARY pushbutton on the menu bar. To clear the kWDemand Log, press the RESET pushbutton on the menu bar.
kW Demand Log Setup	Screen 1	The Current kW Demand Log Setup screen 1 displays the current user-defined log settings. If no log settings are configured, the screen will display kWLOG DISABLED. Press the SETUP pushbutton on the kW Demand Log Summary menu bar to display the Current kW Demand Log Setup screen 1. To return to the kWDemand Log Summary screen, press the return arrow pushbutton on the menu bar.
	Screen 2	The Current kW Demand Log Setup screen can be used to set up or change the time interval and maximum level log settings. Press the CHANGE pushbutton on the Current kW Demand Log Setup menu bar to display the Current kW Demand Log Setup screen 2. Use the up or down arrow pushbuttons to highlight the setup function screen desired, then press the SELECT pushbutton to display the function screen. To return to the Current kW Demand Log Setup screen 1, press the return pushbutton on the menu bar.
	Time Interval Monitored Setup	The Time Interval Monitored Setup screen allows the time duration of the event being monitored to be changed. Select TIME INTERVAL MONITORED from the Current kW Demand Log Setup screen 2 menu to display the Time Interval Monitored Setup screen. Use the left or right arrow pushbuttons to select the character position. Use the up or down arrow pushbuttons to change the character value. Once the new value is entered, press the DONE pushbutton. The Time Interval Monitored Setup Save screen is displayed.
	Time Interval Monitored Save	The Time Interval Monitored Setup Save screen lets you save the new time interval, retry another time interval, or abort the change. Press SAVE, RETRY, or ABORT. If SAVE or ABORT is pressed, the action is completed, and the Current kW Demand Log Setup screen 2 displays. If RETRY is pressed, the Time Interval Monitored Setup screen is redisplayed.
	Maximum Level (kW) Setup	The Maximum Level (kW) Setup screen allows the kW limit of the event being monitored to be changed. Select MAXIMUM LEVEL (kW) from the Current kW Demand Log Setup screen 2 menu to display the Maximum Level (kW) Setup screen. Use the left or right arrow pushbuttons to select the character position. Use the up or down arrow pushbuttons to change the character value. Once the new value is entered, press the DONE pushbutton. The Maximum Level (kW) Setup Save screen is displayed.
	Maximum Level (kW) Save	The Maximum Level (kW) Setup Save screen lets you save the new kW limit, retry another kW limit, or abort the change. Press SAVE, RETRY, or ABORT. If SAVE or ABORT is pressed, the action is completed, and the Current kW Demand Log Setup screen 2 displays. If RETRY is pressed, the Maximum Level (kW) Setup screen is redisplayed.
Maximum Current Log Summary		The maximum current log collects information on events where the unit load exceeds a user-defined current limit within a user-defined time interval. The user can choose a time period up to 9999 minutes and a load limit up to 100%. The user can also select whether the limit defined is a three-phase average of the individual phase currents or is a limit defined for each phase individually. In the first case an event is logged if the average across the phases exceeds the defined limit within a given time period and in the second case an event is logged if any individual phase exceeds the defined limit within a given time period. The Maximum Current Log Summary screen displays the number of times the limit has been exceeded, the date of the last log reset, the maximum percent of full load, and the total time over the limit. It also displays the average percent load over the limit. This measurement differs, depending on whether a three-phase average or an individual phase measurement is selected. Press the METERS pushbutton on the main menu bar to display the Unit Meter screens. Scroll through the meter screens using the up or down arrow pushbuttons on the menu bar until the Maximum Current Log Summary screen is displayed.

Function	Subfunction	Operation
Maximum Current Log		The Maximum Current Log screen displays the individual log entries, including the interval date and time frame, the maximum percent of full load during the interval, the total time over limit during the interval, and the number of times over during the interval. If the individual phase option is selected, the phases that exceeded the limit will also be displayed. If no events have occurred, the screen will display LOG EMPTY. Press the LOG pushbutton on the Maximum Current Log Summary menu bar to display the Maximum Current Log screen. To scroll through the individual events, press the up or down arrow pushbuttons on the menu bar. To return to the Maximum Current Log Summary screen, press the SUMMARY pushbutton on the menu bar. To clear the Maximum Current Log, press the RESET pushbutton on the menu bar.
Maximum Current Log Setup	Screen 1	The Maximum Current Log Setup screen 1 displays the current user defined log settings. If no log settings are configured, the screen will display MAXIMUM CURRENT LOG DISABLED. Press the SETUP pushbutton on theMaximum Current Log Summary menu bar to display the Maximum Current Log Setup screen 1. To return to the Maximum Current Log Summary screen, press the return arrow pushbutton on the menu bar.
	Screen 2	The Maximum Current Log Setup screen can be used to set up or change the time interval, the maximum percent of load, and the calculation method (three-phase average or individual phases) log settings. Press the CHANGE pushbutton on the Maximum Current Log Setup menu bar to display the Maximum Current Log Setup screen 2. Use the up or down arrow pushbuttons to highlight the setup function screen desired, then press the SELECT pushbutton to display the function screen. To return to the Maximum Current Log Setup screen 1, press the return arrow pushbutton on the menu bar.
	Time Interval Monitored Setup	The Time Interval Monitored Setup screen allows the time duration of the event being monitored to be changed. Select TIME INTERVAL MONITORED from the Maximum Current Log Setup screen 2 menu to display the Time Interval Monitored Setup screen. Use the left or right arrow pushbuttons to select the character position. Use the up or down arrow pushbuttons to change the character value. Once the new value is entered, press the DONE pushbutton. The Time Interval Monitored Setup Save screen is displayed.
	Time Interval Monitored Save	The Time Interval Monitored Setup Save screen lets you save the new time interval, retry another time interval, or abort the change. Press SAVE, RETRY, or ABORT. If SAVE or ABORT is pressed, the action is completed, and the Maximum Current Log Setup screen 2 displays. If RETRY is pressed, the Time Interval Monitored Setup screen is redisplayed.
	Maximum % of Full Load Setup	The Maximum % of Full Load Setup screen allows the full load limit of the event being monitored to be changed. Select MAXIMUM % of FULL LOAD from the Maximum Current Log Setup screen 2 menu to display the Maximum % of Full Load Setup screen. Use the left or right arrow pushbuttons to select the character position. Use the up or down pushbuttons to change the character value. Once the new value is entered, press the DONE pushbutton. The Maximum % of Full Load Setup Save screen is displayed.
	Maximum % of Full Load Save	The Maximum % of Full Load Setup Save screen lets you save the new load limit, retry another load limit, or abort the change. Press SAVE, RETRY, or ABORT. If SAVE or ABORT is pressed, the action is completed, and theMaximum Current Log Setup screen 2 displays. If RETRY is pressed, the Maximum % of Full Load Setup screen is redisplayed.
	Calculation Method Setup	The CalculationMethod Setup screen allows the full load limit of the event being monitored to be changed. Select CALCULATION METHOD from the Maximum Current Log Setup screen 2 menu to display the Calculation Method Setup screen. Select CALCULATION METHOD from the Maximum Current Log Setup screen 2 menu to display the Calculation Method Setup screen. Use the up or down arrow pushbuttons to highlight the calculation method desired, then press the SELECT pushbutton. The action is completed, and the Maximum Current Log Setup screen 2 displays. To return to the Maximum Current Log Setup screen 1, press the return arrow pushbutton on the menu bar.

Function	Subfunction	Operation
System Level 0 Setup	Function Selection	This screen can be used to set the screen contrast, show the firmware versions installed, identify the unit type and enter a password to access Level 1 functions. Press the SETUP pushbutton on the main menu bar to display the System Setup Level 0 Screen. No password is necessary to access Level 0 functions. Use the up or down arrow pushbuttons to highlight the setup function screen desired, then press the SELECT pushbutton to display the function screen.
	Contrast Adjust	Select CONTRAST from the System Setup Level 0 menu to display the Contrast Adjust screen. Use the left or right arrow pushbuttons to adjust the contrast for the LCD. When the contrast adjustment is complete, press the SAVE pushbutton. Once the setting is saved, the System Setup screen displays. To return to the System Setup screen without saving the setting, press the return arrow pushbutton.
	Firmware Versions	The Versions screen provides the firmware version numbers installed on the UPS. Select VERSIONS from the System Setup Level 0 menu to display the Versions screen. To scroll through the firmware types, press the up or down arrow pushbuttons on the menu bar. To return to the System Setup screen, press the return arrow pushbutton.
	Identification	The Unit Type screen provides the model, CTO, and serial numbers of the UPS unit. Select UNIT TYPE from the System Setup Level 0 menu to display the Unit Type screen. To return to the System Setup screen, press the return arrow pushbutton.
System Level 1 Setup	Password	The System Setup Level 1 screen can be used to set the UPS date and time, set the serial ports, change the Level 1 password, and log out of Level 1. In addition, the Level 0 functions are available. A password is required to access the Level 1 functions. To enter the password, select ENTER PASSWORD from the System Setup Level 0 menu to display the Enter Password screen. Use the left or right arrow pushbuttons to select the password character position. Use the up or down arrow pushbuttons to change the password character. Once the password is entered, press the DONE pushbutton. The System Setup Level 1 menu screen is displayed. The default password is L1.
	Function Selection	Use the up or down arrow pushbuttons to highlight the setup function screen desired, then press the SELECT pushbutton to display the function screen. The Level 1 screen times out after 60 minutes or can be logged out at any time by selecting the LOG OUT function from the menu screen.
	Change Password	The Change Password screen allows the System Setup Level 1 password to be changed. Select CHANGE PASSWORD from the System Setup Level 1 menu to display the Change Password screen. Use the left or right arrow pushbuttons to select the password character position. Use the up or down arrow pushbuttons to change the password character. Once the new password is entered, press the DONE pushbutton. The Change Password Save screen is displayed.
	Change Password Save	The Change Password Save screen lets you save the new password, retry another password, or abort the password change. Press SAVE, RETRY, or ABORT. If SAVE or ABORT is pressed, the action is completed, and the System Setup screen displays. If RETRY is pressed, the Change Password screen is redisplayed.
	Time Format	The Time Format Setup screen allows the selection of either month/day/year or day/month/year formats for display on the screen and for logging events in the Event and History Logs. Select DATE AND TIME from the System Setup Level 1 menu to display the Time Format Setup screen. Use the up or down arrow pushbuttons to highlight the desired format, then press the SELECT pushbutton to display the Set Date and Time screen. To return to the System Setup screen, press the return arrow pushbutton.
	Set Date and Time MM/DD/YYYY	The Set Date and Time MM/DD/YYYY screen allows the internal date and time of the UPS to be set in the month/day/year format. The date and time information is used for display on the screen and for logging events in the Event and History Logs. Use the left or right arrow pushbuttons to highlight the setting to be changed. Use the up or down arrow pushbuttons to make the change. When finished making changes, use the left or right arrow pushbuttons to highlight SAVE and the up or down arrow pushbuttons to select YES. To complete the save function and return to the System Setup screen, select the return arrow pushbutton.

Function	Subfunction	Operation
	Set Date and Time DD/MM/YYYY	The Set Date and Time DD/MM/YYYY screen allows the internal date and time of the UPS to be set in the day/month/year format. The date and time information is used for display on the screen and for logging events in the Event and History Logs. Use the left or right arrow pushbuttons to highlight the setting to be changed. Use the up or down arrow pushbuttons to make the change. When finished making changes, use the left or right arrow pushbuttons to highlight SAVE and the up or down arrow pushbuttons to select YES. To complete the save function and return to the System Setup screen, select the return arrow pushbutton.
	Com Port Selection	The Com Port Setup screen allows selection of the serial COM port to set up. Select COM PORT SETUP from the System Setup Level 1 menu to display the COMPort Setup screen. Use the up or down arrow pushbuttons to highlight the the COM port to be set up, then press the SELECT pushbutton. To return to the System Setup screen, press the return arrow pushbutton.
	Com Port Setup	The COM Setup screen is used to change and save the settings for the selected serial communication port. The COM port number selected from the COM Port Setup screen displays. If the changes are not wanted, use the ABORT pushbutton to return to the COM Port Setup screen. Use the up or down arrow pushbuttons to highlight the setting to be changed. Use the return arrow pushbutton to toggle through the values for the setting to make the change. Press SAVE or ABORT. Once the action is completed, the COM Port Setup screen appears.
Control		See paragraph 5.2.6 for details.

Table 5-3. Display menu operation

5.2.6 System controls screen

Press the CONTROLS pushbutton on the main menu bar to display the System Controls screen. LOAD OFF, normal operation, transfer to bypass, charger control, and power module startup and shutdown functions are controlled from this screen. In addition, the screen displays the current status of the UPS and indicates whether the UPS is in Maintenance Bypass or Bypass, and the state of the power module (PM) and battery charger. Figure 5-5 and Figure 5-6 show the System Controls screens.

Use the or pushbutton on the menu bar to toggle the menu bar functions between the two System Controls screens.

For detailed information about using the System Controls, see paragraph 5.3.

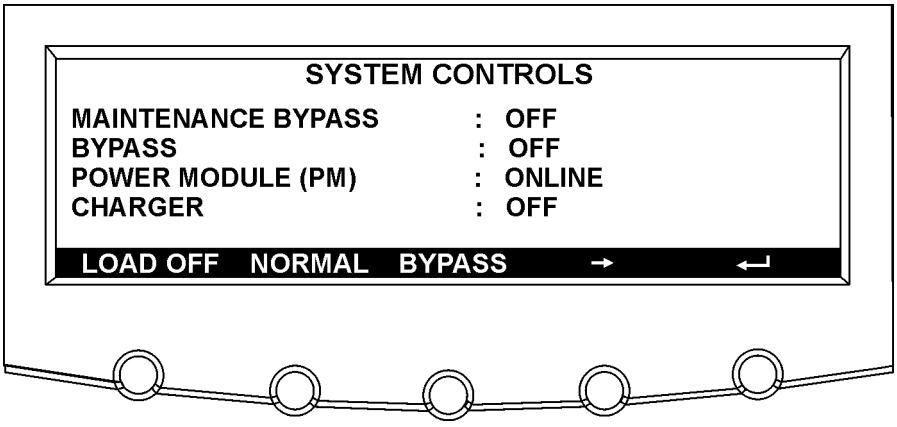


Figure 5-5. System Controls screen 1

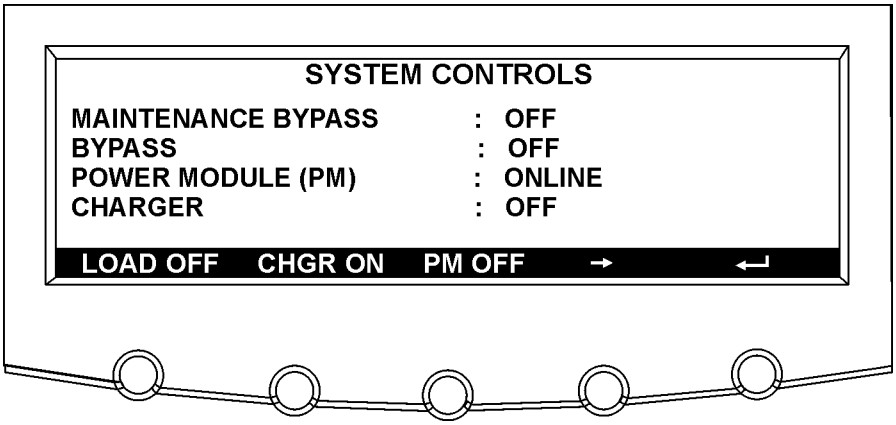


Figure 5-6. System controls screen 2

5.2.7 Load off screen

The load off screen appears when the LOAD OFF pushbutton is selected from the main menu bar or System Controls menu bar. This screen allows the LOAD OFF process to be aborted if the LOAD OFF pushbutton was pressed accidentally. Figure 5-7 shows the Load Off screen. For detailed information about using the LOAD OFF and shutdown screens, see Chapter 5, "UPS operating instructions."

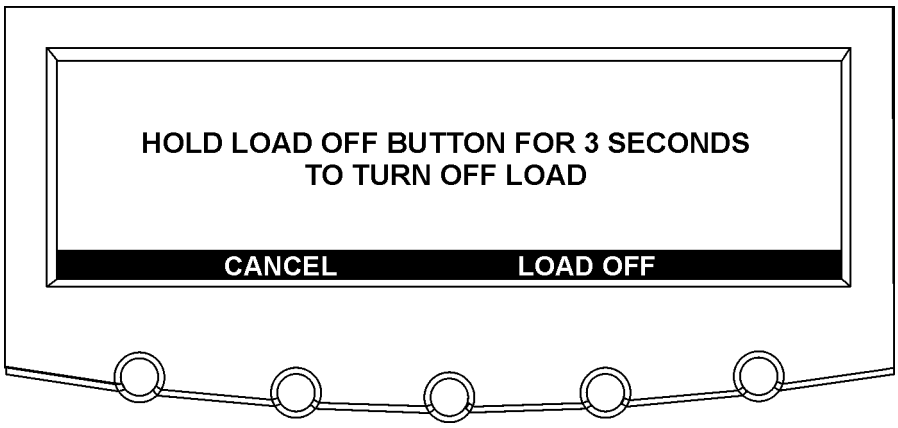


Figure 5-7. Load off screen

5.3 Operation

5.3.1 Starting the UPS in normal mode

To start the UPS system:

1. If the UPS contains input breaker CB1, verify that input breaker CB1 is open.
2. Close the UPS input feeder circuit breaker.
3. Close the UPS bypass input feeder circuit breaker.
4. Observe the UPS control panel display becoming active, indicating logic power.
5. Press the CONTROLS pushbutton on the main menu bar. The system controls screen appears.

6. On the System Controls screen, the power module (PM) status should indicate SHUTDOWN.
7. Close the battery breaker.
8. If the UPS contains input breaker CB1, close input breaker CB1.
9. Press the NORMAL pushbutton on the system controls menu bar.
   If Auto Bypass is enabled (factory default), the critical load is immediately supplied by the bypass source, in Bypass mode, until the inverter turns on and the UPS transfers to Normal mode. The status indicator on the UPS control panel indicates the UPS is in Bypass mode.
   If auto bypass is not enabled, the UPS output remains off until the UPS transfers to normal mode.
10. Observe the following messages appear sequentially on the power module (PM) status line:

    DC STARTING
    INVERTER STARTING
    INVERTER SYNCING
    READY
    ONLINE

    The rectifier and inverter turn on. The inverter continues to ramp up to full voltage.

    Once the inverter reaches full voltage, and the battery breaker is closed, the UPS output contactor K3 closes and the static switch turns off. Power is now supplied to the Critical load in Normal mode. It takes approximately 1 minute for the UPS to achieve Normal mode.
11. The UPS is now operating in Normal mode and the NORMAL status indicator is illuminated.

5.3.2 Starting the UPS in bypass mode

If the inverter output of the UPS is not available and the critical load needs to be energized, perform the following procedure:

CAUTION

In Bypass mode, the critical load is not protected from commercial power interruptions and abnormalities.

---

1. If the UPS contains input breaker CB1, verify that input breaker CB1 is open.
2. Close the UPS input feeder circuit breaker.
3. Close the UPS bypass input feeder circuit breaker.
4. Observe the UPS control panel becoming active, indicating logic power.
5. Press the CONTROLS pushbutton on the main menu bar. The System Controls screen appears.
6. On the System Controls screen, the power module (PM) status should indicate SHUTDOWN.
7. If the UPS contains input breaker CB1, close input breaker CB1.
8. Press the BYPASS pushbutton on the System Controls menu bar.
   The critical load is immediately supplied by the bypass source, in Bypass mode.
9. The UPS is now operating in Bypass mode and the BYPASS status indicator is illuminated.

5.3.3 Starting the power module

To start the power module without transferring the critical load to normal, perform the following procedure:

1. If the UPS contains input breaker CB1, verify that input breaker CB1 is open.
2. Close the UPS input feeder circuit breaker.
3. Close the UPS bypass input feeder circuit breaker.
4. Observe the UPS control panel becoming active, indicating logic power.
5. Press the CONTROLS pushbutton on the main menu bar. The System Controls screen appears.
6. On the System Controls screen, the power module (PM) status should indicate SHUTDOWN.
7. If the UPS contains input breaker CB1, close input breaker CB1.
8. Press the pushbutton to display System Controls screen 2.
9. Press the PM ON pushbutton on the System Controls menu bar.
10. Observe the following messages appear sequentially on the power module (PM) status line:

    DC STARTIN
    INVERTER STARTING
    INVERTER SYNCING
    READY

    The rectifier and inverter turn on. When the inverter reaches full voltage, the UPS is ready to transfer to the normal mode and supply the critical load.

5.3.4 Transfer from normal to bypass mode

To transfer the critical load to Bypass mode, perform the following procedure:

CAUTION

In Bypass mode, the critical load is not protected from commercial power interruptions and abnormalities.

1. Press the CONTROLS pushbutton on the main menu bar. The System Controls screen appears.
2. Press the BYPASS pushbutton on the System Controls menu bar. The UPS transfers to Bypass mode and the critical load is immediately supplied by the bypass source. If the bypass source is not available, the power processor remains on and an alarm sounds.
3. The UPS is now operating in Bypass mode and the BYPASS status indicator is illuminated. The power module (PM) status indicates READY. The system is now on bypass and the UPS power processor remains on.

WARNING

Power is present inside the UPS cabinets.

5.3.5 Transfer from bypass to normal mode

To transfer the critical load to Normal mode, perform the following procedure:

1. Press the CONTROLS pushbutton on the main menu bar. The System Controls screen appears.
2. Press the NORMAL pushbutton on the System Controls menu bar. The UPS transfers to Normal mode. If the power processor is not available, the system remains on bypass and an alarm sounds.
3. The UPS is now operating in Normal mode, and the NORMAL status indicator is illuminated. The power module (PM) status indicates ONLINE.

5.3.6 Transfer from normal to bypass mode and shut down UPS

To transfer the critical load to Bypass mode and shut down the UPS, perform the following procedure:

1. Transfer the critical load to bypass by performing the procedure in paragraph 5.3.4.
2. Press the CONTROLS pushbutton on the main menu bar. The System Control screen appears.
3. Press the pushbutton to display System Controls Screen 2.
4. Press the PM OFF pushbutton on the System Controls menu bar.

The power module (PM) status indicates SHUTDOWN. The input and output contactors open, the battery breaker or disconnect is tripped, and the power module is turned off. The bypass source supplies the critical load.

WARNING

Power is present inside the UPS cabinets.

5.3.7 UPS and critical load shutdown

To perform maintenance or service on the critical load, shut down power to the load by performing the following procedure:

1. Turn off all equipment that is being powered by the UPS.
2. Perform the LOAD OFF procedure in paragraph 5.3.9. The input, output, and bypass backfeed contactors open, the battery breaker or disconnect is tripped, and the power module is turned off.

WARNING

Power is present inside the UPS cabinet until the upstream input feeder circuit breaker is opened.

3. If the UPS contains input breaker CB1, open the UPS input breaker CB1.
4. Open the UPS input and bypass feeder circuit breakers.

5.3.8 Charger control

To turn the battery charger on or off, perform the following procedure:

1. Press the CONTROLS pushbutton on the main menu bar. The System Control screen appears.
2. Press the pushbutton to display System Controls Screen 2.
3. Press the CHGR ON or CHGR OFF pushbutton on the System Controls menu bar to toggle the charger on or off.

5.3.9 Using the UPS LOAD OFF pushbutton

A UPS Load Off is initiated by the LOAD OFF pushbutton from the main menu bar or the System Controls menu bar. This pushbutton can be pressed to control the UPS output. The UPS LOAD OFF pushbutton de-energizes the critical load and powers down the UPS.

The UPS (including Bypass) remains off until restarted.

To use the LOAD OFF pushbutton:

1. Press the LOAD OFF pushbutton.
   The Load Off screen appears, providing a choice to proceed or abort the shutdown.

CAUTION

All power to the critical load is lost when the LOAD OFF is selected in the following step. You should use this feature only when you want to de-energize the critical load.

---

2. To shut down the UPS, press LOAD OFF from the Load Off menu bar, and hold for three seconds. To abort the shutdown, press CANCEL. When LOAD OFF is selected and held for three seconds, the input, output, and bypass backfeed contactors open, the battery breaker or disconnect is tripped, and the power module is turned off.

CAUTION

Do not attempt to restart the system after Load Off until the cause of the shutdown has been identified and cleared.

---

3. To restart the UPS after pressing the LOAD OFF pushbutton, follow the procedure in paragraph 5.3.1 or 5.3.2.

5.3.10 Using the Remote Emergency Power-off switch

A UPS emergency power-off is initiated by the REPO pushbutton switch. In an emergency, you can use this switch to control the UPS output. The REPO switch de-energizes the critical load and powers down the UPS immediately, without asking for verification. The UPS, including Bypass, remains off until restarted.

CAUTION

All power to the critical load is lost when the REPO switch is activated in the following step. You should use this feature only when you want to de-energize the critical load.

NOTE

The following instructions are for the Eaton Corporation-supplied REPO switch. If a customer-supplied REPO switch is used, it may not activate in the same manner; refer to the operating instructions provided with the switch.

To use the REPO switch:

1. Press the REPO pushbutton switch.

The input, output, and bypass backfeed contactors open, the battery breaker or disconnect is tripped, and the power module is turned off immediately, without asking for verification.

CAUTION

Do not attempt to restart the system after Load Off until the cause of the shutdown has been identified and cleared.

2. To restart the UPS after using the REPO pushbutton, reset the REPO switch and then follow the procedure in paragraph 5.3.1 or 5.3.2.

5.3.11 Using Mechanical Bypass Switch

The operation of the integral MBS is allowed for a trained person only who is familiar with the UPS behaviour and functions. The full UPS wiring diagram with a MBS switch is presented in the installation part of the manual.

NOTE!

The integral MBS and Static Bypass need to supplied by the same source.

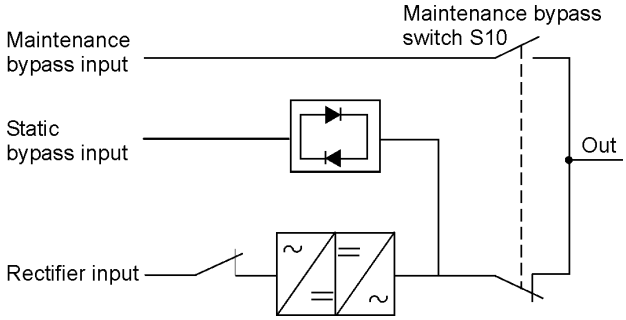
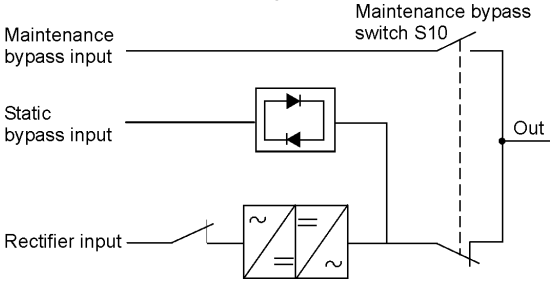


Figure 5-8. The normal positions of the MBS switches and rectifier disconnect switch (must be located in the site wiring).

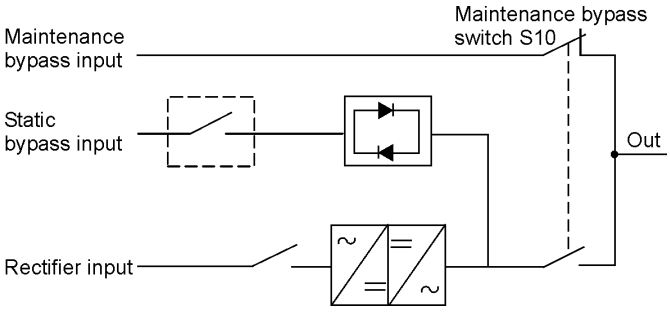
Turn UPS from normal mode to mechanical bypass

The procedure to turn the UPS to mechanical bypass switch is described below.

1. The normal start position should be following:



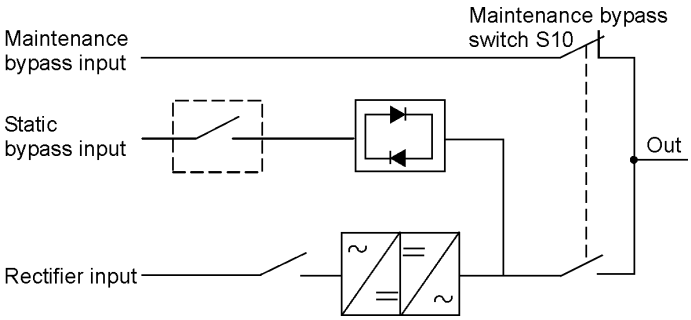
2. Perform transfer from normal mode to bypass mode as described in paragraph 5.3.4. Remember to verify the transfer before proceeding the next step.
3. Turn the switch S10 from UPS (II) position to Bypass (I) position.
4. Perform LOAD OFF procedure contained in paragraph 5.3.9.
5. Turn OFF the rectifier switch to disconnect UPS rectifier input.
6. Turn OFF the Static bypass switch to disconnect UPS bypass input:
7. UPS is now in the mechanical bypass mode, see below:



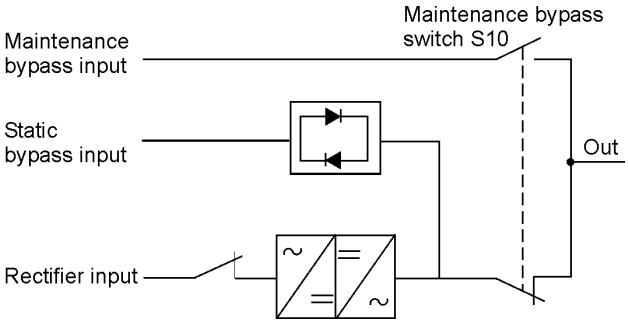
Turn UPS from mechanical bypass to normal mode

The procedure to turn the UPS back to normal mode is described below.

1. The normal start position should be following:



2. Turn ON rectifier switch to connect rectifier input to UPS.
3. Turn ON Static bypass switch to connect bypass input to UPS:
4. Perform UPS start-up procedure (bypass mode) contained in paragraph 5.3.2.
5. Turn S10 switch from bypass position to UPS position to connect UPS output to load.
6. Perform transfer from bypass to normal mode as described in paragraph 5.3.5. Remember to verify the transfer before proceeding the next step.
7. UPS is now in Normal mode, see below:



6 Responding to system events

6.1 General

When the UPS system is running in Normal mode, it continually monitors itself and the incoming utility power. In Battery or Bypass modes, the UPS may issue alarms to let you know exactly what event caused the change from Normal mode. System events on the UPS can be indicated by horns, lights, messages, or all three. Select Events from the menu bar on the Main Menu screen to look at the Active System Events screen. This screen shows any currently active alarms, notices, or commands. For more information on using the Events screen, see paragraph 5.2.5, “Display menu operation” on page 51.

6.2 System event horns

The system event horn beeps to alert an operator that an event needing attention is taking place. Horn 1 cycles at a one-second rate.

6.3 System event indicators

The status indicators on the UPS control panel and the event horn let you know when the UPS system is operating in any mode other than Normal. Only the Normal indicator is visible during normal UPS system operation. The other indicators illuminate to indicate alarms or events. When an alarm occurs, first check these indicators to see what type of event has taken place. For descriptions of the status indicators, see paragraph 5.2.1, “Status indicators” on page 49.

6.4 System event messages

When a system event occurs, a message appears on the LCD in the UPS status area. This message is also written to the Active Events log and may be added to the Events History log. The messages are divided into four categories: alarms, notices, status, and commands.

The top line of the LCD scrolls all active notices and alarms. The top line of display blinks while scrolling when the system needs attention. Some notices and alarms may be accompanied by an audible horn. To silence the horn, press any control panel pushbutton once.

7 Communication

This chapter describes the communication features of the Powerware 9395 450–550 kVA UPS and provides information about connecting hardware and using Terminal mode. For terminal wiring information, see paragraph 2.2.3 on page 17 and paragraph 3.5 on page 28. For location of the customer interface panels and terminals, see Figure 3-3 on page 26 and Figure 3-7 through Figure 3-9 starting on page 30.

7.1 X-Slot cards

The Powerware 9395 UPS four X-Slot communication bays (see Figure 3-7 on page 30 for). The UPS is compatible with the following X-Slot cards (see Figure 7-1):

- Modbus card - provides direct integration of UPS information (meters and status) to a Building Management System (BMS) using the Modbus RTU protocol.
- ConnectUPS-X Web/SNMP card - provides remote monitoring through a Web browser interface, e-mail, and a network management system (NMS) using SNMP; connects to a twisted-pair Ethernet (10/100BaseT) network. It has a built-in switching hub that allows three additional network devices to be connected to the network without the requirement of additional network drops. This card is provided as standard equipment with the UPS.

NOTE

The Modem card cannot be installed in X-Slot 2.

- Modem card - provides “out-of-band” remote notification and monitoring using modem communication directly to cell phones and pagers.
- Relay Interface card (AS/400) - has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Low battery, UPS alarm/OK, or On bypass when interfacing with IBM® AS/400 computers, other relay connected computers, and industrial applications.
- Industrial Relay card (IRC) - indicates the operating status of the UPS system using the customer’s monitoring equipment. The IRC uses four isolated normally-open or normally-closed dry relay contacts to indicate the UPS status. Normal, Bypass, Battery, and Alarm modes can be monitored.

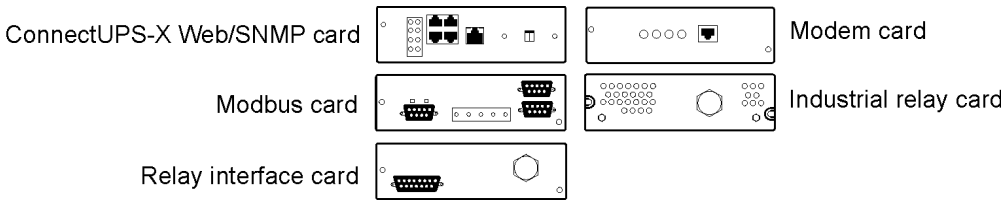


Figure 7-1. Optional X-Slot cards

7.2 Powerware LanSafe Power Management Software

Each Powerware 9395 UPS ships with LanSafe Power Management Software. To begin installing Powerware LanSafe software, see the instructions accompanying the Software Suite CD.

Powerware LanSafe software uses an RS-232 serial link to communicate with the UPS. The software provides up-to-date graphics of UPS power and system data and power flow, a complete record of critical power events, and notification of important UPS or power information. With custom views for monitoring status and metering information, various user groups can select the most useful view for their specific needs. Powerware LanSafe® Power Management Software

7.3 Terminal mode

NOTE

The brackets ([ ]) in the following bullets indicate standard keyboard characters. To use a keycombination, hold down the Escape key and press the indicated letter key.

In Terminal mode, the user can request the following:

- [ESC] [A] displays the Active Alarms.
- [ESC] [H] displays the Event History.
- [ESC] [N] displays the Node Bits Setup.
- [ESC] [V] displays the UPS control panel.
- [ESC] [Q] Quit.

7.3.1 Display UPS control panel

When this function is invoked, a facsimile of the UPS control panel is displayed on the terminal screen. All controls are functional and can control the UPS remotely. The only exception is the Load Off control which requires the operator to press and hold the local control for three seconds to shut down the UPS.

To remotely control the UPS or view UPS information, use the escape key legend to control the function normally controlled by the control panel softkeys. See paragraph 5.2 on page 49, “Using the control panel,” for instructions on navigating the control panel.

7.3.2 Event History Log

This key sequence prints the entire Event History Log of the UPS at the time the data is requested. The printout begins with the oldest alarm entry in the queue and ends with the most recent. Any alarms that occur while the Event History Log is printing are included in chronological order.

The Event History Log lists up to 500 system events in chronological order with the most recent event listed last. Figure 7-3 shows a sample Event History Log printout.

In this mode, system events are continually logged through the serial port to the device connected to the port.

The printed log entries contain a time and date stamp and the alarm text message. Terminal mode uses this format for printing alarm entries:

MM DD YYYY HH:MM:SS.hh KYWD MESSAGE <CR> <LF>

Where	Equals
MM	Month (2 digits)
DD	Day (2 digits)
YYYY	Year (4 digits)
HH	Hour (2 digits)
MM	Minute (2 digits)
SS	Second (2 digits)
hh	Hundredths of Second (2 sdigits)
KYDW	Keyword (ALARM, NOTICE, COMMAND, or STATUS)
Message	System Diagnostic Information
<CR>	Carriage Return Character (ASCII 13)
<LF>	Line Feed (ASCII 10)

An alarm message is prefixed by the word “CLEAR” whenever an alarm is entered into the Event History Log with a cleared status.

If a port is operating in Terminal mode and is connected to a computer, you can press [Esc] [H] to print the entire log with a firmware version header. The log in terminal mode is always in english.

MODEL: POWERWARE 9395
CTO: TF12710000000
SERIAL:

MCU DSP:	**70.81.14**	
MCU BOOTLOADER:		**80.40**
MCU PLD:	**1.00**	
PMF 1 DSP:	**80.81.14**	
PMF 1 BOOTLOADER:		**80.40**
PMF 1 PLD:	**1.00**	
XSLOT CAN BRIDGE:		**0.00**
CSB DSP:	**70.81.14**	
CSB BOOTLOADER:		**1.12**
DISPLAY:	**1.06**	

TIME: 19:17:16 DATE: 03/23/2099
03/16/2099 21:25:20.355 S138: CONTROL POWER ON (PM1)
03/16/2099 21:25:20.515 N011: OUTPUT UNDER OR OVER FREQ (PM1)
03/16/2099 21:25:20.675 S302: EEPS CONFIGURING (PM1)
03/16/2099 21:25:23.475 N267: POWER MODULE CABLE FAIL 15 (PM1)
03/16/2099 21:25:25.180 N271: DC HW AMPS LIMIT (PM1)
03/16/2099 21:25:25.215 N007: INPUT AC UNDER VOLTAGE (PM1)
03/16/2099 21:25:25.850 N011: OUTPUT UNDER OR OVER FREQ OK (PM1)
...
03/23/2099 18:59:20.450 A199: BATTERIES DISCONNECTED (PM1)
ACTIVE ALARMS:
11 NOTICE: OUTPUT UNDER OR OVER FREQ (PM1)
12 ALARM: REMOTE EMERGENCY POWER OFF (MCU)
102 NOTICE: INVERTER L1 CURRENT LIMIT (PM1)
103 NOTICE: INVERTER L2 CURRENT LIMIT (PM1)
104 NOTICE: INVERTER L3 CURRENT LIMIT (PM1)

Figure 7-3. Sample Event History Log

7.4 Building alarm monitoring

This standard feature lets you connect the UPS to your building alarms, such as smoke detectors or overtemperature alarms. The customer interface terminals for external connections are located inside the UPS. You should use twisted-pair wires for each alarm input and common.

The building alarms can be programmed to display the alarm functional name.

7.5 General purpose relay contact

One general purpose relay contact is provided as a standard feature on the UPS. The alarm contact is located inside the UPS on the customer interface terminal board.

You can use a normally-closed or normally-open contact. If the state of the contact changes from the state you specify as normal, a signal is issued. You can connect this contact to equipment at your facility (such as a light or an alarm bell) to let you know when an alarm is active on the UPS. This feature is useful if the UPS is located in a remote area where the UPS horn may not be heard immediately.

CAUTION

Contacts should not be operated in excess of 30 Vac @ 5A maximum.

8 UPS maintenance

The components inside the UPS cabinet are secured to a sturdy metal frame. All repairable parts and assemblies are located for easy removal, with very little disassembly. This design allows authorized service personnel to perform routine maintenance and servicing quickly.

You must schedule periodic performance checks of your UPS system to keep it running properly. Regular routine checks of operation and system parameters enable your system to function efficiently for many trouble-free years.

8.1 Important safety instructions

Remember that your UPS system is designed to supply power EVEN WHEN DISCONNECTED FROM THE UTILITY POWER. The UPS module interiors are unsafe until the DC power source is disconnected and the electrolytic capacitors are discharged. After disconnecting the utility power and the DC power, authorized service personnel should wait at least five minutes for capacitor bleedoff before attempting internal access to the UPS module.

WARNING

- **Servicing and maintenance should be performed by qualified service personnel only.**
- **LETHAL VOLTAGE PRESENT. This unit should not be operated with the cabinet doors open or protective panels removed. Do not make any assumptions about the electrical state of any cabinet in the UPS system.**

Since each battery string is an energy source in itself, opening the battery circuit breaker does not de-energize the voltage within the battery string. DO NOT ATTEMPT TO ACCESS ANY INTERNAL AREA OF THE BATTERY STRING YOURSELF. VOLTAGES ARE ALWAYS PRESENT IN THE BATTERY STRING. If you suspect that a battery string needs service, you should contact your service representative.

If the string requires service, refer to the battery manufacturer's operating manual for instructions on battery maintenance or contact your service representative.

Observe these precautions when working on or around batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries or battery cabinets.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Determine if the battery is inadvertently grounded. If it is, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock is reduced if such grounds are removed during installation and maintenance.
- When replacing batteries, use the same number of sealed, lead-acid batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.

8.2 Performing preventive maintenance

The UPS system requires very little preventive maintenance. However, the system should be inspected periodically to verify that the units are operating normally and that the batteries are in good condition.

8.2.1 DAILY maintenance

Perform the following steps daily:

1. Check the area surrounding the UPS system. Ensure the area is not cluttered, allowing free access to the unit.
2. Ensure the air intakes (vents on the front doors) and exhaust opening (on top of the UPS cabinet sections) are not blocked.
3. Ensure the operating environment is within the parameters specified in paragraph 2.2.1 on page 10 and Chapter 10, "Product Specifications."
4. Ensure the UPS is in Normal mode (Normal status indicator is illuminated). If an alarm lamp is illuminated or the Normal status indicator is not illuminated, contact your service representative.

8.2.2 MONTHLY maintenance

Perform the following steps monthly:

1. Monitor system parameters as described in paragraph 5.2, "Using the Control Panel" on page 49.
2. Check the air filters (located behind the front doors) and wash or replace as necessary. The left (ISBM) filter size is 12"×20"×1" and the right (UPM) filter sizes are 19.5"×21.5"×0.5". Contact your service representative for replacement filters. To remove the filters:
   a. Open the front door latch and swing the doors open.
   b. Grasp foam filters and remove filters from cabinet mounted studs.
   c. Push the washed or new filters onto the cabinet mounted studs until seated against cabinet.
   d. Close the doors and secure the latch.
3. Record the check results and any corrective actions in a suitable log.

8.2.3 ANNUAL maintenance

Annual preventive maintenance should be performed only by authorized service personnel familiar with maintenance and servicing of the UPS system. Contact your service representative for more information about service offerings.

8.2.4 BATTERY maintenance

Contact your service representative for battery maintenance. Battery replacement and maintenance should be performed only by authorized service personnel.

8.2.5 Maintenance training

A basic training course, available from Eaton Corporation, gives you a competent working knowledge of the UPS system operation and teaches you how to perform first level corrective maintenance. For more information about training and other services, contact the Eaton Help Desk for Powerware products.

8.3 Installing batteries

NOTE

There is no DC disconnect device within the UPS.

Install batteries in accordance with the battery and battery cabinet or battery rack manufacturer's instructions.

9 Recycling the used UPS or batteries

Before scrapping UPS or its battery cabinet, the battery bank must be removed. Local requirements must be followed in battery recycling or discard. The removal of batteries is allowed only by authorised service personnel due to high energy and voltage.

Do not discard waste electrical or electronic equipment in the trash.
For proper disposal, contact your local collecting/recycling/reuse or hazardous waste center and follow the local legislation.

These symbols indicate on a product:

Use proper local collecting centers meeting local legislation when handling waste of electrical and electronic equipment.

WARNING!

HAZARDOUS MATERIALS. Batteries may contain HIGH VOLTAGES, and CAUSTIC, TOXIC and FLAMMABLE substances. Batteries can injure or kill people and damage equipment if used improperly. DO NOT DISCARD unwanted batteries or battery material in the public waste disposal system. Follow ALL applicable, local regulations for storage, handling and disposal of batteries and battery materials

10 Product specifications

10.1 Model numbers

The UPS systems are housed in free-standing cabinets with safety shields behind the doors. The UPS systems are available in 50/60 Hz with various output power ratings.

Models	Power Rating	Frequency
Powerware 9395-550/450	450 kVA	50/60 Hz
Powerware 9395-550/550	550 kVA	50/60 Hz

The following sections detail the input, output, environmental, and battery specifications for the UPS.

10.2 Single module specifications

10.2.1 UPS system input

Operating Input Voltage (Nominal + –15%)	400 Vac for operation from 340 Vac to 460 Vac
Operating Input Frequency Range	±5 Hz
Operating Input Current	See Table 3-4 on page 3-6. Reduced for Generator Adjustable
Input Current Harmonic Content	5% THD at full load
Power Factor	Minimum 0.98
Line Surges	6 kV OC, 3 kA SC per ANSI 62.41 and IEC 801-4
Battery Voltage	480 Vdc

10.2.2 UPS system output

UPS Output Capacity	100% rated current
Output Voltage Regulation	±1% (10% to 100% load)
Output Voltage Adjustment (Nominal +/–3%)	380 Vac nominal, adjustable from 368.6 Vac to 391.4 Vac 400 Vac nominal, adjustable from 388 Vac to 412 Vac 415 Vac nominal, adjustable from 402.5 Vac to 427.5 Vac
Output Voltage Harmonic Content	1.5% max THD (linear load) 5% max THD (nonlinear load)
Output Current	See Table 3-4 on page 3-6.
Output Voltage Balance	3% for 100% maximum load imbalance (linear load)
Output Voltage Phase Displacement	3° for 100% maximum load imbalance (linear load)
Output Transients	±5% for 100% load step or removal
Frequency Regulation	±0.1 Hz free running
Synchronous to Bypass	Bypass within voltage limits of +5%, –8% of output setting; bypass within ±3 Hz
Frequency Slew Rate	1 Hz per second maximum
Overload Capability	110% for 10 minutes 125% for 30 seconds 150% for 10 seconds
Max battery charging current	120 A

10.2.3 Environmental

Operating Temperature	0 to 40°C without derating. The recommended operating temperature is 25°C.
Operating Altitude	Maximum 1500m at 40°C without derating
Storage Temperature	–25 to +60°C, excluding batteries (prolonged storage above 40°C causes rapid battery self-discharge)
Relative Humidity (operating and storage)	5% to 95% maximum noncondensing
Acoustical Noise	75 dB at a 1m distance, c weighted
EMI Suppression	Meets EMC EN 62040-2:2006 specification
Electrostatic Discharge (ESD) Immunity	Meets IEC 61000-4-2 specification

11 Warranty

The product is warranted against defects in design, materials and workmanship for a period of twelve (12) months from its original date of purchase. The local office or distributor may grant a warranty period different to the above and refer to local terms of liability as defined in the supply contract. The UPS manufacturer is not responsible for

- Any costs resulting from a failure if the installation, commissioning, repair, alternation, or ambient conditions of the equipment do not fulfil the requirements specified in the documentation delivered with the unit and other relevant documentation.
- Equipment subjected to misuse, negligence or accident
- Equipment comprised of materials provided or designs stipulated by the purchaser.

Under no circumstances shall themanufacturer, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, losses or penalties.

The technical data, information and specifications are valid at the time of printing. The UPS manufacturer reserves the right to modifications without prior notice.